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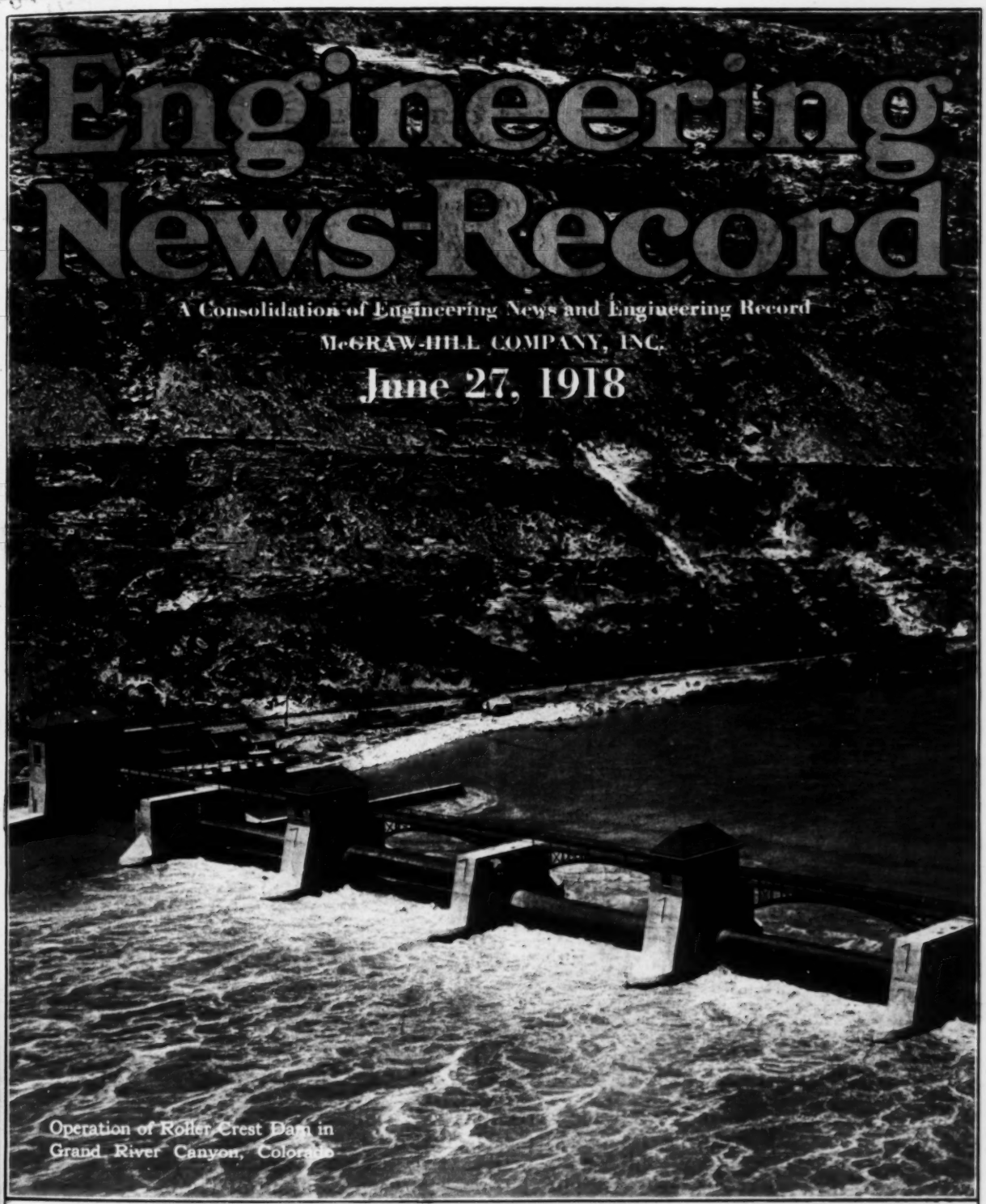

Operation of Roller Crest Dam in Grand River Canyon, Colorado

Suggested Reform in Floor Load Requirements of Building Laws
By R. FLEMING

Build Concrete Extension to Superior Ore Dock of Northern Pacific Railway

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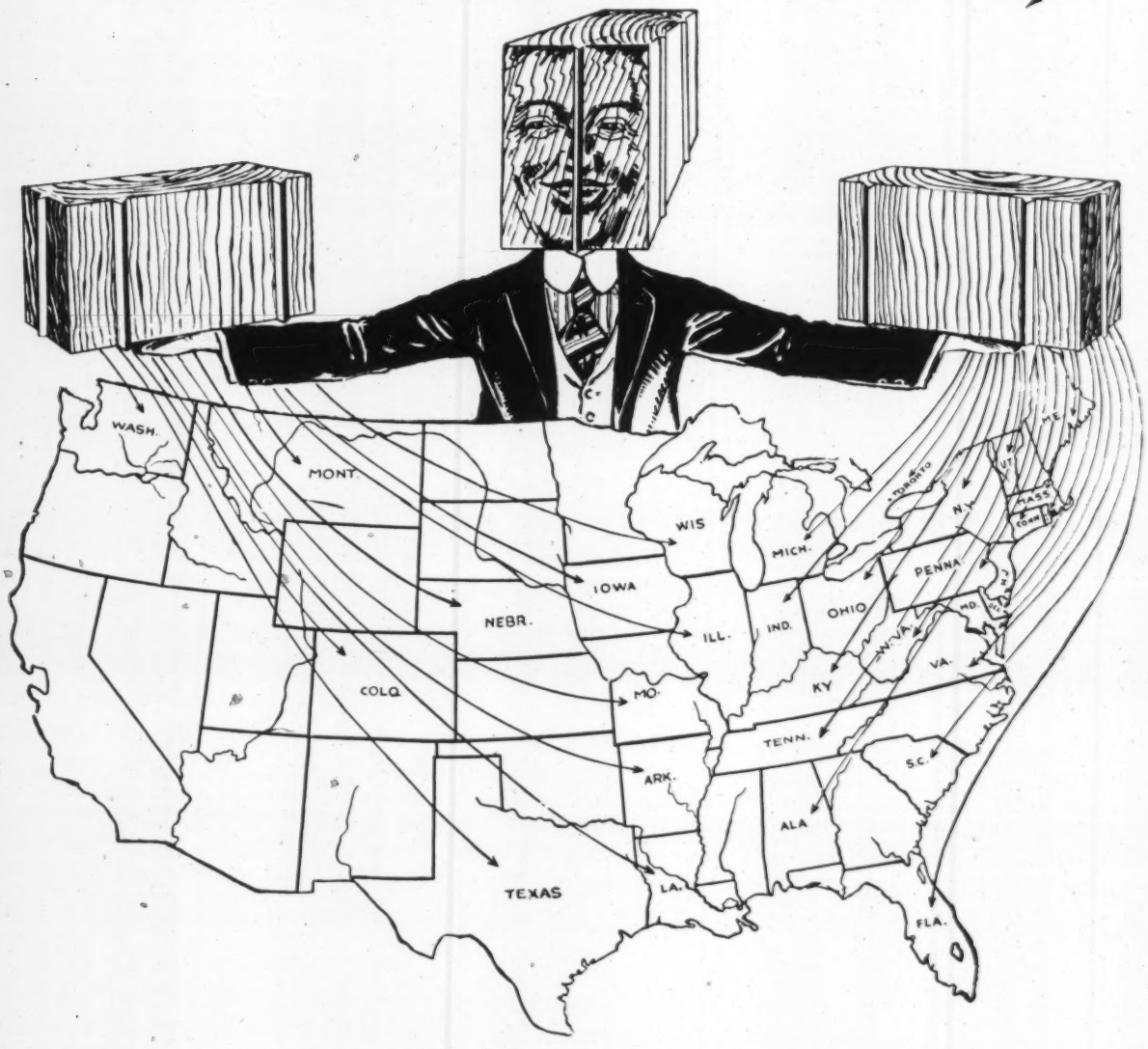

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN, Editor
CHARLES WHITING BAKER, Consulting Editor

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Committee on Development of the American Society of Civil Engineers

The following preamble and resolutions were adopted by the Board of Direction, June 18, 1918:

The development and application of the sciences in recent decades have caused profound changes in the social and industrial relationships of all peoples.

The engineer has been a leader in this progress.

Sociological and economic conditions are in a state of flux and are leading to new alignments of the elements of society.

These new conditions are affecting deeply the profession of engineering in its services to society, in its varied relationships to communities and nations, and in its internal organization.

A broad survey of the functions and purposes of the American Society of Civil Engineers is needed in order that an intelligent and effective readjustment may be accomplished so that the society may take its proper place in the larger sphere of influence and usefulness now opening to the profession.

Such a survey and readjustment can be accomplished successfully only with the aid of the membership throughout the country.

Any steps toward changes in organization must lead to a revision of the constitution of the society, which has not been materially modified for many years, during which the society has grown rapidly and has established 22 local associations of members.

The constitution should be revised only after securing the views of the membership of the society, as to what its purposes and activities should be and as to the instrumentalities through which these purposes and activities should be carried out.

Any changes in organization must take into account all the conditions above indicated, and also the relationship of the American Society of Civil Engineers to other engineering organizations and to the public.

Therefore, resolved, that a committee be created to report on the purposes, field of work, scope of activity and usefulness, organization, and methods of work of the American Society of Civil Engineers, and to make recommendations concerning these matters; the committee to consist of one member chosen by each local association of members, and seven members at large appointed by the president.

Resolved, that the president be instructed to select from this committee an executive committee of not less than five nor more than nine members and to appoint the chairman of this executive committee, who shall also be the chairman of the general committee.

Resolved, that the president be instructed to prepare a precept for the general guidance of this committee.

Resolved, that this committee be requested to present to the Board of Direction a preliminary report, not later than Nov. 1, 1918, so that it may be printed and distributed to the membership in advance of the annual meeting in January, 1919, at which meeting it will be presented for discussion.

BY FAR the best news in things engineering in many a day is the action of the Board of Direction of the American Society of Civil Engineers in creating a committee on development. Its mere creation would be of importance, but when the project is launched with a preamble setting forth the effect of world changes upon the work of the engineer, and indicating that such changes necessitate a broad survey of the functions and purposes of the society, to the end that it "may take its proper place in the larger sphere of influence and usefulness now opening to the profession," we have reason for the greatest satisfaction. Surely this action must mark the end of the ultra-conservative régime for which the society has been noted. It aligns itself with the forces that are to help bring order out of chaos when peace comes. It is to prepare now to play its part. Assuredly the influence and help of the leading body of engineers will be needed in the determination of a

social, economic and political order more largely conditioned by engineering, by science, than any other the world has known. Not only is the society to be congratulated, but also the profession at large and the public. We sense from the spirit of the preamble of the resolutions that the public is to be the chief gainer from the awakening.

NO ONE, we believe, is in a position to commend this action more heartily than is this journal. For years its predecessors, *Engineering News* and *Engineering Record*, were persistent critics of the society, while their pages were a forum where the profession discussed the society's inactivity. There, too, was found the news of the activities of other bodies forming a striking contrast with the society's inaction, and helping to build up the sentiment that has culminated in the board's resolution. The rôle of critic has not been a pleasant one, for the traditonal policy of the society has been to discourage criticism of its affairs and to attempt to discredit those who differed with the management. The differences, happily, have now disappeared, and this journal is sure that its own endorsement of the committee will be matched in heartiness by that of the former ultra-conservative group, now apparently converted.

IMPROVEMENT can hardly be made either in the preamble or in the resolutions themselves. The charter is a broad one. There is recognition of the influence of engineering on social and industrial relationships, of the part the profession and the society should play in the reconstruction following the war, of the necessary rewriting of the society's constitution to fit the new conditions, of the responsibility of the society to the public. The committee is bidden to survey "purposes, field of work, scope of activity and usefulness, organization and methods of work," and to make recommendations concerning these matters. Fortunately, it is *not* a committee of the board of direction (though there may be board members on it); the geographical distribution is wide, and the resolution demands results—a preliminary report by Nov. 1—so that the committee cannot remain inactive. On account of the mode of selection provided there will not be merely wide geographical distribution, but a varied membership, progressive and conservative, while best of all the committee begins its work under a president, Professor Talbot, who has demonstrated in the reports of the committees on concrete and reinforced concrete and on stresses in railway track his ability to grasp a problem broadly, to lay out an all-inclusive program, to devise methods for getting *all* the facts, to draw sound conclusions, and to put facts and conclusions together into a report that carries conviction. His talent and leadership are a warrant that the committee will produce a fruit fully up to the hopeful promise of its charter.

THOSE accepting membership on the committee will be undertaking a great responsibility—but will have an opportunity commensurate thereto. They will have a part in preparing this great society for its place in the social order that shall come out of the war. The part played will be big or little, fruitful for newborn generations or innocuous, pregnant with possibilities for future influence or sterile, in accordance with the grasp displayed by the committee. No one should accept membership who cannot give it much time, hard, painstaking work, who will not accept it as a patriotic as well as a professional duty. Rightly appraised, it will rank with war work in its service to the nation.

FINALLY, the American Society of Civil Engineers has by this action set a great example for the other national engineering societies. They, too, need to appoint development or reconstruction committees. Four such committees at work would inevitably compare notes, and coöperate, with the result that the whole profession would be advancing "company front" on a program based on the broadest investigation and most thorough discussion of the engineer's relations to his work, to his professional brethren, and to society. The opportunity is such as has never before been put before the profession. Counting on the progressiveness of the national societies of mechanical, electrical and mining engineers, we predict that the opportunity will not be neglected.

Joint Management of Water and Light Plants

CONSOLIDATION of the municipal water and light plants of a small Western city is proposed. There are a number of such consolidations under private ownership and a few under public. Not the least of the arguments for joint operation of such works is that the smaller cities can readily afford the services of a single technically trained manager where the chances are that with separate operation two mediocre men would be employed at a combined salary nearly if not quite as large as would be required for an able manager. Conservation of managerial ability is a still stronger reason for joint management in war time.

Mosquito Control an Engineering Problem

MOSQUITO reduction, which is rightly receiving considerable attention, but deserves far more, is primarily an engineering problem. The first point of attack should be the removal of breeding places by drainage. Oiling is a mere palliative, although often necessary until drainage can be effected or where for any reason it cannot be successfully carried out. The mosquito is always a nuisance and often a grave danger. Successful control under the most trying conditions shows that there is no excuse for the mosquito pest and danger in this country. Give engineers a moderate amount of money and they will conquer the mosquito and malaria, as they have already, water-borne typhoid.

Existing Sewers Should Be Utilized to the Utmost

WAR conditions have brought sewer extensions to a standstill in many cities. This makes it all the more desirable that such lateral sewers as have been provided should be utilized to the utmost. In Louisville, Ky., there are 20,000 privy vaults, according to Major L. F. Fricks, who is in charge of work being done there by the U. S. Public Service in the interest of the extra-cantonment zone. Presumably a large percentage of

these are on sewered streets. The same is true of thousands of privy vaults in other cities. What is needed in such cases is, first, backbone on the part of the city authorities to pass an ordinance requiring all houses on streets with sewers to be connected with the sewers and their privies and cesspools abolished, and good stiff backbone to enforce the ordinance. No Capital Issues Committee stands in the way of such action.

Government to Control All Supply of Labor

EVERY employer should give the fullest measure of support to the Department of Labor in its assumption of the responsibility for the distribution of labor among the industries of the country. The department has taken the only practicable means of ending the confusion that now prevails in the labor market. The country cannot afford to have contractors on Government work and manufacturers of war materials bidding against each other for men. Neither can it afford to permit manufacturers of things that could be temporarily dispensed with to dip into the almost empty reservoir of labor. On the other hand, the department is assuming a tremendous responsibility. It must keep things moving. It must really supply labor to those that should be supplied. If it cannot meet these calls as well as the present method of unrestricted competition for labor, the object of the step will not be gained, and we will be compelled to return to inadequate methods. If general support gives assurance of success it should not fail. We are daily demonstrating the national willingness to change existing practices if war needs are thereby served.

Centralizing Federal Highway Control

WITH the organization of the United States Highway Council, reported in the news section of this issue, it is hoped that the last knot of the highway construction and maintenance tangle has been untied. Heretofore, it has been necessary for those desiring money, materials, or transportation facilities for highway work, to get permission from several Government agencies. This entailed great loss of time and money. The committee now formed, because of its composition, will presumably be able to settle expeditiously all questions relating to highways, to issue permits, establish priorities and, in general, to coördinate all departments having to do with highway work. If the authority proves to be as wide as is indicated, the public can expect this council to act constructively and promulgate a policy which will establish definitely the basis on which work may go forward. Negative action in curtailing work is not sufficient for the present emergency, but definite action taken after a broad view of conditions and setting forth just what may be done would relieve the uncertainty under which the various highway departments and material interests have had to labor.

Reconstruction Program Making Progress

JUST as in England thought began to be given to reconstruction when the military program was well in hand, so here, seeing clearly now the demands that war makes and the sacrifices, personal and financial, that are necessary, we are beginning to think of the era that will follow the conflict. We are determined that we shall be better prepared for peace than we were for war. If we do not meet the return of peace with a well-matured program we shall experience a very severe depression, with great hardships for those seeking reëntrance to civil life, and chaos in converting the régime of Government control into a peace-time system. That we mean to be prepared is becoming more evident every day. The articles by Wingrove Bathon on a reconstruction commission printed in this paper and in the other McGraw-Hill publications have created a profound impression, and have undoubtedly been a factor in expediting the action of the cabinet members, acting as the Council of National Defense, in recommending to the President the designation of the council as the coördinating and directing head of such a commission. Further recent developments are the meeting last week in Chicago of a group of manufacturers and publishers to consider plans for after-the-war expansion and the action of the American Society of Civil Engineers in creating a committee on development. Moreover, C. H. Blackall, the eminent Boston architect, in an article reprinted on p. 1238, calls upon the architectural profession to consider its status after the war. Preparedness for peace—no less important than preparedness for war—such is the mission of all these studies of reconstruction and readjustment.

Federal Control of Transportation Must Take Precedence of State Control

FEDERAL control of interstate commerce established by the Constitution may not be interfered with by the action of any State. This one principle would seem to be sufficient to make null and void the law recently passed by the New York Legislature declaring that any railroad bridge built across the Hudson below Troy must have the approval of the State Engineer and the Superintendent of Public Works.

Federal statutes give to the Army engineers the authority over structures erected on or over navigable streams. It is well settled that the control of navigation on all streams which form a link in interstate commerce is under Federal jurisdiction. If the State were also given authority, the way would at once be opened for State interference with the free flow of commerce in order to benefit local interests.

As described in *Engineering News-Record* of May 30, the passage of the New York law was an outcome of opposition by the city of Albany to the project of the New York Central R. R. to build a new bridge over the Hudson River at Castleton, a few miles below Albany, and a cut-off line to divert freight trains around the congestion of the Albany district.

Albany opposed the Castleton bridge and cut-off ostensibly because it was asserted that the bridge would interfere with navigating ocean steamers to Albany at some time in the future. The real reason was the fear that Albany would suffer in prestige by being "left on a side track."

Under private ownership and management the railways have generally been powerless to carry out needed works for public benefit in the face of local opposition.

Under Government operation it should no longer be possible for the political influence of a city or of a State to obstruct works that are in the interest of the nation as a whole.

As for the Castleton bridge project, the expenditure of five or six million dollars and some 25,000 tons of steel is a large enterprise in the present emergency, in spite of the urgent need of relief for freight congestion in the territory affected. The principle involved, however, is too important to be passed by without notice. Consideration for the desires of local authorities where local conditions are concerned must not be carried to the length of permitting any State to dictate regarding interstate transportation in a case where the State's requirements run counter to the national interest.

Bad Garbage Contract System Prevails at Philadelphia and Elsewhere

ANOTHER chapter has been written in the long story of garbage contract mismanagement in America. Philadelphia is again the scene, and letting a yearly contract for work requiring large capital outlay is the setting. This time a point has been scored in favor of the city but the gain is not as large as it should be and the incident serves to call attention yet again to one of the weakest spots in municipal administration in this country.

For reasons best known i Pennsylvania, the legislature of that state withholds power from Philadelphia to let a garbage collection and disposal contract for more than a year. The case would be bad enough if equipment for collection were the only capital outlay required from the contractor, but a huge and costly reduction plant has to be provided as well.

This means either an enormous price for the service, an immense capital risk, or a gamble on political control—perhaps more correctly all three. To make the game safer for the contractor and for his political partners, the common practice is to defer invitation of bids until well toward the end of the yearly contract. Under the Blankenburg administration, M. L. Cooke, then director of public works, secured reduction in contract prices for two years, then an underbid from a competitor of the concern which had held the contract for six or eight years; but the low bidder succumbed before the end of the year—as the sponsors for this system intend shall be the result if anyone ventures to break in. Mr. Cooke then tried early advertising for bids, but the old contractor, feeling secure again, would not bid early and got the contract later. The legislature refused to give the city control of the situation and the price mounted up again. This year, the early bidding plan was again tried. The present contractor again refused to bid so long in advance, but a bid was put in and a contract has been awarded at a price $89,000 lower than the present contract price, as stated in more detail on p. 1245. The new bidder is said to represent the American Agricultural Chemical Co., and therefore may be expected to command capital, practical experience and technical ability.

Congratulations for Philadelphia must be tempered with the reflection that whatever its gain under the new contract may prove to be it might have been greater and more permanent under a rational contract system. The new bidder assumes risks on a one-year contract which would disappear under say a ten-year contract period, with provisions for renewal on terms protecting both parties. In other words, the contract price might have been lower still had the contractor's risks been reduced to reasonable proportions.

Including garbage collection and disposal in one contract not only lessens competition, the two branches of the service being so different, but it also blinds the eyes and blunts the judgment of the city when it attempts to determine the reasonableness of the bids. Garbage now has considerable value for either reduction purposes or food for hogs. Whether a city is getting this value for its garbage is uncertain unless the material is bid for separately.

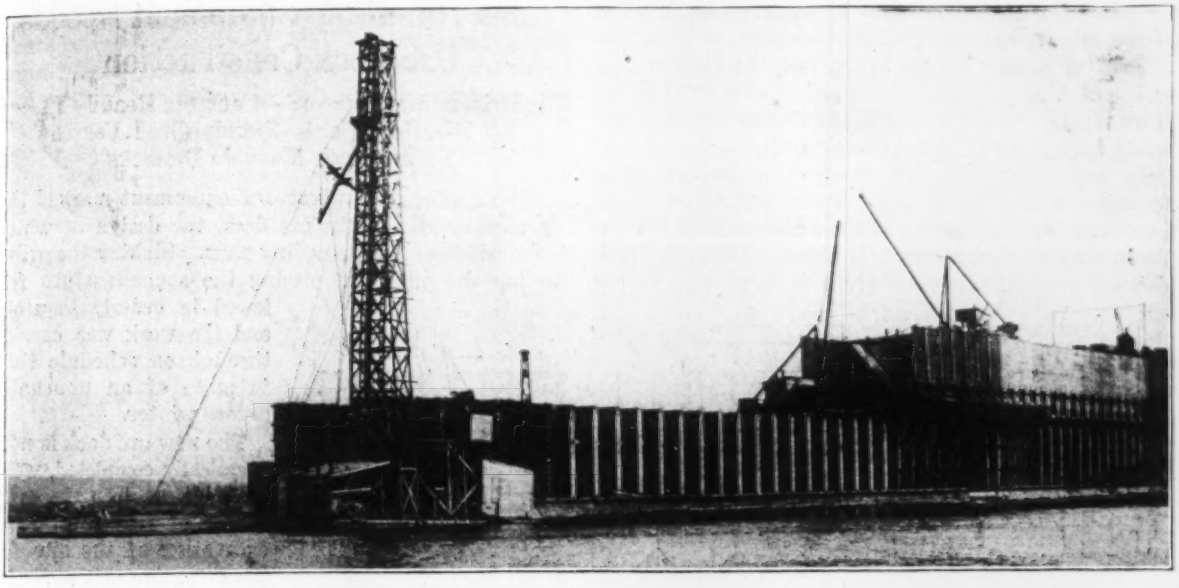
Philadelphia does not stand alone in mishandling garbage-disposal contracts, but considering its size and the badness of its usual practice it seems to afford the worst example.

Dump Cars May Relieve Car Shortage

USE of large dump cars to transport such bulk material as gravel, sand and broken stone is one means of partly offsetting the shortage of freight cars. Dump cars of this class, having a capacity of 12 to 30 cu.yd., are in common use for main-line transportation of excavated material in railway construction and improvement work. Some railways which have a considerable number of such cars have been putting them to good use recently in the haulage of materials for their own concrete work. Contractors have similar equipment which could be used for their own work or made available for general transportation.

It would seem practicable to utilize these cars also for hauling coal, especially on short hauls between local mines and towns. In fact, some mines are using them to haul coal from the shaft to stockpiles at times when no railway cars are on hand for loading. In this way they avoid the necessity of shutting down the mines while waiting for a supply of cars. Sand has proved a troublesome material to transport by dump cars in some cases, especially with old cars, as there is likely to be considerable loss by leakage around the movable sides. For continuous use of this kind, however, it would be an easy matter to fit canvas or building paper along the sides, to cover the joints.

The load capacity of a large dump car is relatively small, as compared with a gondola car, owing to the shallow sides. Higher sides have been fitted to some of the cars used at coal mines, so as to increase the capacity materially. This might not be desirable for cars in railway service, however, owing to the high center of gravity of the load. Cars of this class intended for railway operation on main lines have standard couplings and air-brake equipment to meet the requirements of the Federal regulations. The principal precaution needed is the blocking, chaining or otherwise securing of the bodies to prevent undue swaying or accidental dumping in transit. On the whole, it appears that the use of the dump car in certain lines of freight traffic may be developed to a considerable extent to meet present conditions and emergencies.



Extension to Superior Ore Dock Built of Concrete

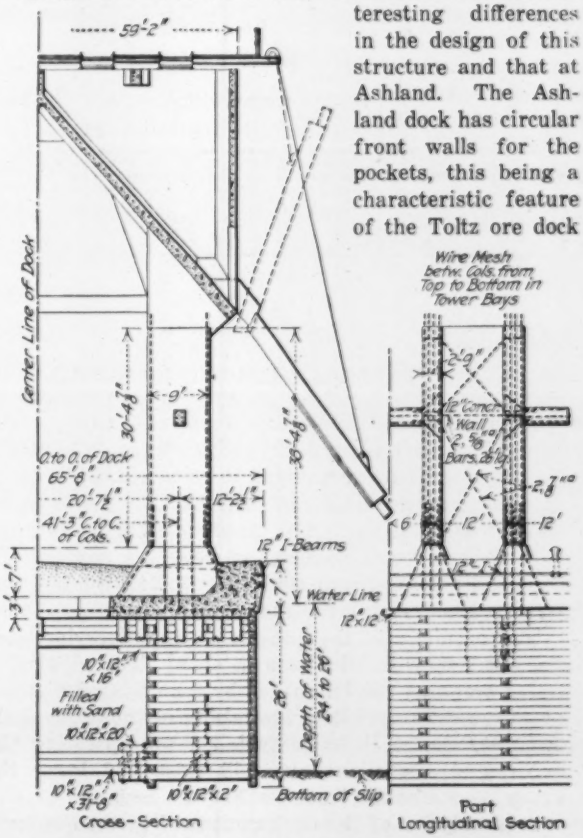
Northern Pacific Structure Has Frame Resting on Wood Piles and Sand-Filled Timber Cribs—Detail Differences from Similar Older Design

A REINFORCED-CONCRETE extension to an existing steel ore dock is now being completed for the Northern Pacific Ry. at Superior, Wis. This is the second concrete structure for this use, the first being the one built for the Minneapolis, St. Paul & Sault Ste. Marie Ry., at Ashland, Wis., and described in *Engineering News*, Aug. 10, 1916. The two structures have something in common, but the details are sufficiently different to warrant a description of the later of the two.

The old Northern Pacific dock was 612 ft. long, with steel pockets tied to a concrete foundation. It had 102 of these pockets, each with a capacity of 350 tons, or seven carloads. The extension is 600 ft. long and will have 100 pockets of the same capacity.

As shown in the detailed drawings herewith, the foundation of the extension is a timber crib 66 ft. wide and 600 ft. long. The crib is made up of outer walls each 16 ft. wide and 25 ft. deep, driven full of 60-ft. piles on 3-ft. centers. The crib was built in two sections 400 and 200 ft. long. They were erected on the ice, which was cut out from around them when they were ready to be sunk. After being sunk the entire inclosure, as well as the crib walls, was filled within one foot of the top with sand pumped in by a suction dredge. The pile cutoff was 1 ft. above the sand level. On the sand there was then placed a reinforced-concrete mat with a parapet wall and fender 8-ft. high and overhanging the crib 12 in., as shown in the detail. The base of this fender is protected by two 12-in. 35-lb. I-beams set in the concrete to take the shock from landing boats.

On the concrete mat, the top of which is above water level, are the foundation columns which support the reinforced-concrete pockets or bins. These columns or posts are 2 ft. 9 in. by 9 ft. 4 in. in section and are spaced 12 ft. center to center lengthwise of the dock and set back from the face of the fender 6 ft. 6 in. Each post is directly under the dividing wall of a pocket and this wall has for additional support a bracket extending down to the cross beams tying together opposite posts. The bins themselves are concrete sloping walls reinforced as slabs. There are some interesting differences in the design of this structure and that at Ashland. The Ashland dock has circular front walls for the pockets, this being a characteristic feature of the Toltz ore dock



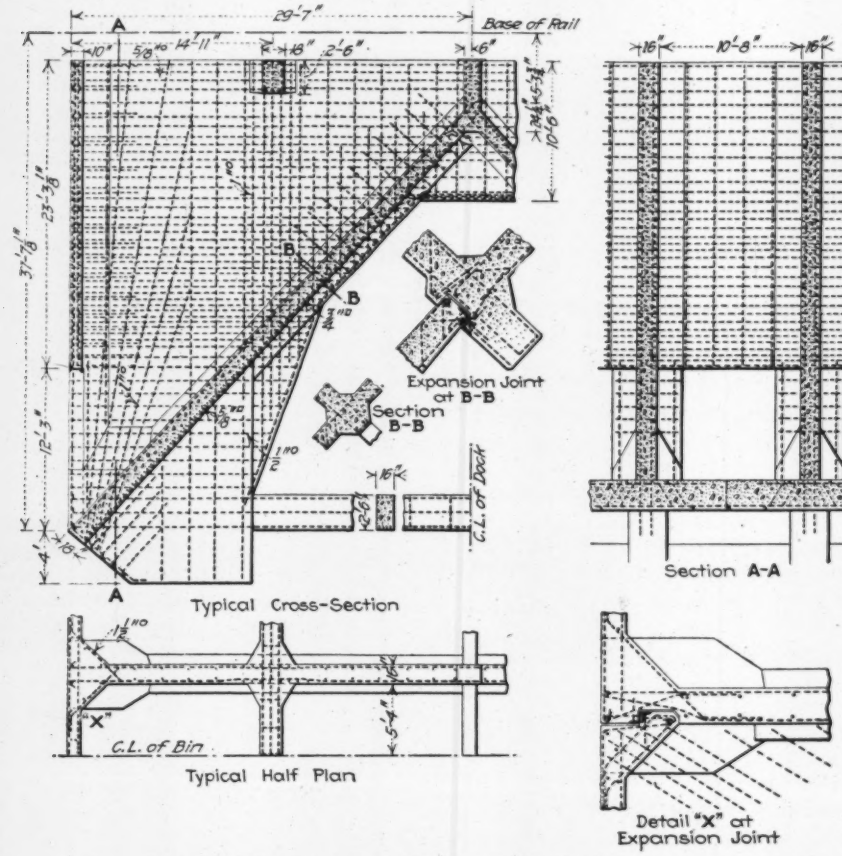
GENERAL DETAILS OF NEW CONCRETE EXTENSION TO NORTHERN PACIFIC RAILWAY'S ORE DOCK

patents under which the Ashland dock was built. The thrust of the ore in the pockets is taken care of by the circular band rods running back into the bin dividing walls. At Superior the front walls are flat slabs 10 in. thick placed at right angles to the transverse walls, the whole being figured as a rectangular bin.

In both docks the concrete was poured in three operations: first, the foundation mat and column footings; second, the columns at the under side of the bin floors, and third, the concrete storage bins. At both docks the expansion joints are 120 ft. apart. At the Ashland dock the expansion joint and construction joints were made coincidently, requiring approximately five days' continuous pouring to complete the section. In the Superior dock the construction joints were spaced 24 ft. apart, that is at every other pocket, and only 16 hours was required to pour the section. In both docks the concrete mixture is 1:2:5 for the substructure and 1:2:4 for the pockets.

The openings in the pockets at the Superior dock are 3 x 7 ft. with Dickerson patented steel self-closing gates weighing 850 lb. opened by a hoisting device set on the runway outside of the railing of the upper deck. A power device is to be installed for operating the gates, and a similar hoist will raise and lower the chute located at the track level of the dock.

A description of the equipment used in the construction of the dock, and a list of the personnel engaged in the work, are in the article which follows.



DETAILS OF THE REINFORCEMENT OF THE ORE POCKETS

Good Handling Equipment Speeds Ore Dock Construction

Pile Drivers Make Record—Concrete Readily Placed by Floating Plant—Standardized Forms Swung from Movable Derricks

VERY effective contractors' equipment marked the construction of the ore dock, the design of which is described on the preceding page. Sinking the cribs, driving the piles and placing the superstructure followed in orderly sequence and the work was carried through on schedule time in spite of an unusually severe winter.

The new ore dock is now practically completed, work having started in the early winter of 1916-1917. The excavation of the site for the extension was made by the Zenith Dredge Co., of Duluth, and was just completed when the bay began to freeze over. As soon as the ice sheet was strong enough work was started on the crib. As the sides of the crib were tied through with sets of 10 x 12-in. timbers at every third panel point, six courses of timber had to be laid up before sinking could be started. The ice was then cut out along the lines of the timber and allowed to float up in each compartment.

The crib was sunk by means of sand pockets and after the sinking was started was kept so that the top course only was slightly above the ice. This greatly reduced the labor of handling and placing of timbers. A hoisting engine on the shore yarded all the timber out on the ice with a long cable working through a tail block. The piling was afterward handled in the same way. The crib timbers were placed by a small crew of men with peaveys. Three air boring machines were used for boring the holes and drift bolts were driven with 10-lb. sledges. The greatest difficulty was found in keeping the crib cut free from the ice and in breaking away the ice from under the timbers after the settlement began.

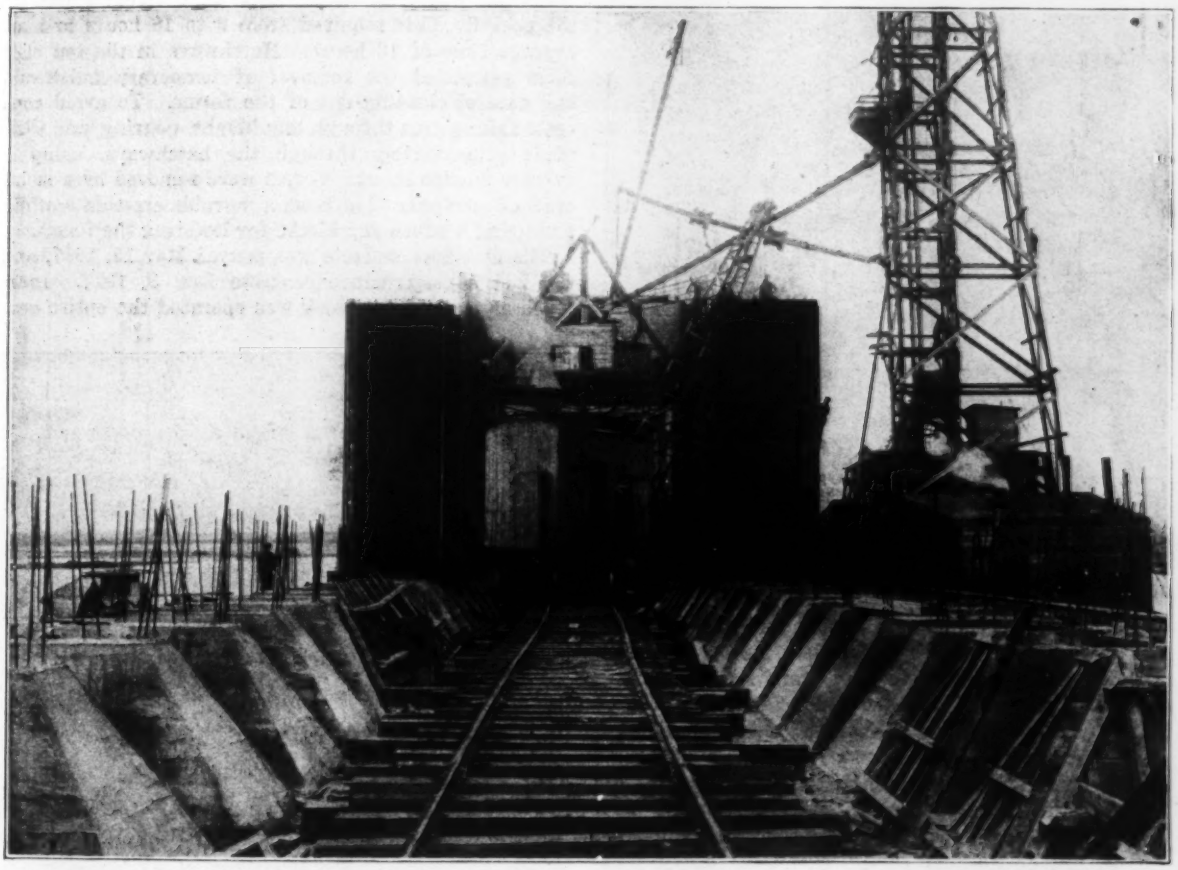
After the crib was seated the interior ice cakes were removed and the piledriving began. This was done by two turntable drivers equipped with 60-ft. leads and drop hammers. One driver with an 8¼-in. x 10 hoisting engine and swinging gear and a 4300-lb. hammer drove 168 60-ft. piles in 9 hr. Each rig drove over 200 piles per day when working conditions were at

all favorable. A 48-in. circular saw working in a short set of leads, the frame of which was built similar to a light turntable driver, was used for cutting off the piles. This machine moved on rails along the deck of a scow and all piles were reached by it except the center row, which had to be cut by hand.

The railway company provided two tracks on a sand fill west of the dock site for handling material and plant. The contractor extended one of these tracks across the shore end of the slip on a pile trestle and then under the existing dock and along its center line to the new work. As the work of the dock extension progressed this track was extended along its center line, using the I-beams of the permanent top of the dock for stringers. A switch was put in this track under the old dock and this second spur was carried up an incline over the sand and gravel bins, which were located at the end of the old dock.

Drop bottom cars were used and after being switched to the foot of the incline by a contractor's locomotive they were pulled up over the bins by means of a cable and low-geared hauling engine. The sand and gravel were run out of these bins by hopper gates onto a 16-in. belt conveyor running under the bins and then by means of a short cross-conveyor to another 16-in. belt running along the outer edge of the new concrete base to the concrete plant. This plant was arranged to pour 60 ft. of the base at a setting and the belt was extended as the work progressed in 60-ft. sections.

The concrete plant consisted of a 32 x 80-ft. scow with a 128-ft. tower equipped with Insley quick shift boom and hopper spouting outfit which permitted quick adjustment for three different elevations required for base, columns and bins, and a ¾-yd. batch mixer surmounted with batch hopper and charging hoppers which were supplied by a bucket conveyor. A movable tripper delivered sand and gravel from any required point along the belt conveyor into the boot of the bucket conveyor on the mixer scow. A 7 x 10-in. engine operated the concrete bucket and the quick shift boom rig, also being equipped with a third drum and niggerheads for moving the scow. Cement was delivered partly by tender scow and partly by ordinary warehouse trucks from cars standing on center-line track. Three tender scows were used to deliver and store materials, forms and reinforcing rods. This plant has poured 342 cu.yd. of concrete in less than nine hours. The total yardage poured was approximately 20,000 cubic yards.

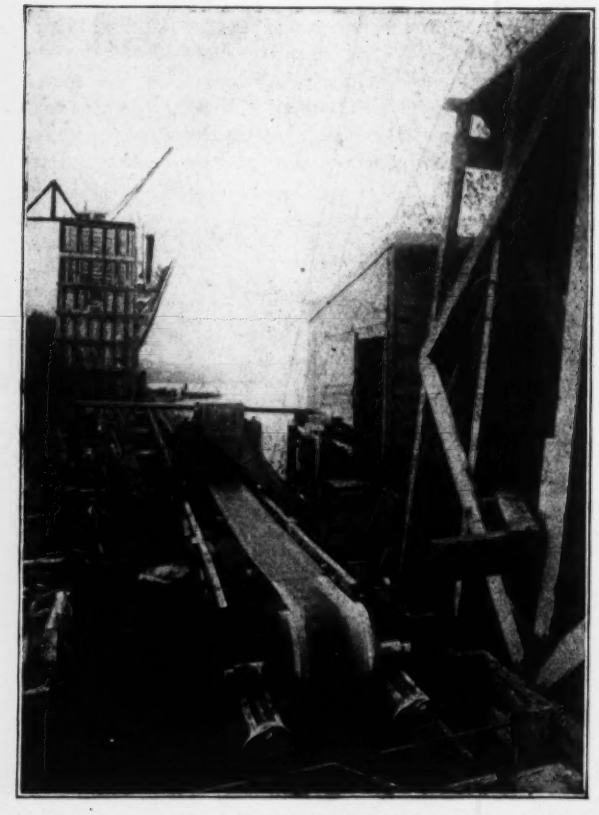


LOCOMOTIVE CRANE HANDLING FORMS—STIFFLEG DERRICK ON COLUMNS AND CONCRETE CHUTING PLANT

Forms were built on shore from plans prepared by the contractors. Everything was made to template and a power-saw rig was used wherever possible in order to reduce the number of pieces handled. The form panels were made as large as could be set with the der-

rick equipment. Study was made in preparing details to permit of easy removal and to avoid the use as much as possible of temporary stays as forms were erected.

The base or mat forms were set by a scow derrick. The reinforcing rods were then assembled on temporary scaffolds, properly tied and sunk into place. Forms for



BELT CONVEYOR TAKES CONCRETE MATERIAL TO MIXER

diamond-shape openings along the center line of the dock were assembled into a complete unit on the deck of the scow and then set in the water in one operation. Lookout timbers had been provided along the side of the crib to provide a seat for the outside fender forms which were erected in 24-ft. panels.

The column forms were made in six pieces, two for each side and one full length section for each end. They were clamped with ¾-in. tie-rods and Universal clamps, but on account of the extremely heavy pressures, threaded rods and nuts were substituted on the lower walings. Forms were erected and removed by a locomotive crane working on track along center line.

At the request of the contractor the concrete tie member under the bins was changed from a cast-in-place beam to one precast in the material yard and raised to place by locomotive crane. This provided a support for the traveling platform used in erecting bents, trusses, etc. These ties weighed nine tons. One stiffleg derrick with 80-ft. boom moved on top of concrete columns and set all forms up to and including the under side of the bin slab. This machine also placed steel bin mouths and outside wall forms. Forms of approximately three of the bin slab floors were placed ahead of the concrete work to permit of placing the slab reinforcing rods.

A second movable derrick with 80-ft. boom, moving on top of the finished concrete bins, set and removed the forms from the upper side of the bin floor and the bin walls. Both derricks served the steel reinforcing crew. Bin floor reinforcement being in place, the top form of the bin floor slab (in two sections) was set and this in turn supported the wall form. As soon as one wall form was set and braced the entire wall reinforcement was set and tied. This method permitted accurate setting and spacing, with freedom for workmen, who operated on light swinging scaffolds suspended with manila rope tackle. The other form of the 16-in. side wall was then set and tie rods placed. Pockets were poured, two double pockets at a time, a construction joint being made on the center line of the pocket. This required from 9 to 16 hours and an average time of 12 hours. Hatchways in the top slab form permitted the removal of temporary bulkheads and careful cleaning out of the forms. To avoid concrete falling free through any height, pouring was then made progressively through the hatchways, using a tubular flexible spout. Forms were removed by a small crew of men operating from a movable erection scaffold and using a winch and blocks for lowering the forms.

The first mat concrete was poured May 15, 1917, and the last superstructure concrete Dec. 3, 1917. Inasmuch as the existing dock was operated the entire sea-

LOOKING OVER THE PILE-FILLED CRIBS

son of 1917, the plant layout was planned to permit entry of ships to slip without delaying construction or the operation of the dock.

The plan was designed and the construction work carried out under the supervision of H. E. Stevens, chief engineer of the Northern Pacific Ry., by M. P. Clements, bridge engineer. Siems, Helmers & Schaffner were the contractors.

Government Steel Requisitions Are on Safe Side

Russia the Key to Post-War Trade, Publisher of Iron Age Tells Meeting of Manufacturers and Publishers Held in Chicago

GOVERNMENT needs for steel are enormous, and department estimates of 1918 requirements (which caused the announcement that no steel would remain for ordinary use) undoubtedly err on the safe side, W. H. Taylor, publisher of *Iron Age*, told the conference between publishers and manufacturers, held June 17, in Chicago under the auspices of the Allied Publicity Bureau.

Mr. Taylor told of some of the recent stupendous achievements of the steel industry, and argued strongly that the future of that industry, and of American business, depend on preventing Germany from gaining control of Russia and realizing independence of American materials. Mr. Taylor's address, in part, was as follows:

This war is more than a conflict between armies. It is a contest between organized manufacturing genius, man power, money, transportation, foodstuffs, raw materials and fuel. I am frequently asked when this war will end. My answer invariably is, "This war will end when we whip Germany." To my mind there are two ways of driving the Germans out of France and Belgium. One, by using the famous German mass formation, which can only be successful after sacrificing millions and more millions of men; the other is to drive them out by overwhelming them with shells and by poisoning them to death with poisonous gas. This will call for large caliber guns in numbers far beyond our present manufacturing capacity. To meet the situation the United States Steel Corporation has begun to build a plant on Neville Island, not far from Pittsburgh, which when completed will be the largest plant for manufacturing ordnance in the world, not excepting the Krupp plant. The specifications for the tools to equip this plant are already in the hands of the tool builders of the United States. In addition to the Neville Island plant, two other enormous plants that will be devoted to the manufacture of large ordnance are to be built this summer. The machine tools necessary to supply these plants, a schedule of which has been published, will cost more than $18,000,000.

Tonnage Must Be Increased

If we win this war at all—and not to win it is unthinkable—it will be because we stretched the American steel industry from 45 to 50 million tons of steel ingots a year, so that every ton of ingots will reach from Pittsburgh to Berlin. Every ton of steel converted into a gun means tons of steel in the future to make shells or projectiles for that gun. Every ton of steel spent in shipyard construction means many tons of steel later for building ships in that yard. Every ton of steel put into a vessel means many tons of steel in future cargo for that vessel to carry to the battle front.

One of the things that the War Department wants is more and better steel. The best steel made in the United States today—I mean in any considerable quantities—is the steel made in the electric furnace, and it is valued highly indeed. Only recently the yearly production of electric steel amounted to practically nothing. Last year there was manufactured in the United States less than 235,000 tons. This year one large mill alone—I refer to the Illinois Steel Co.—will turn out 200,000 tons in addition. The Midvale Steel and another large concern are adding to their plants large electric furnaces that will carry the yearly production well over 500,000. To give you some idea of the value of this steel, the manufacturers assert that it may some day solve the rail problem, as it is tough and ductile at low temperatures. It is asserted that electric steel will double the life of the ordinary rail.

The Steel Situation

In the relations of the Government and the iron and steel industry a new stage has been reached. Four weeks ago the manufacturers were told by the Director of Steel Supply that the Government, its allies and the industries producing war essentials would probably take up the entire output of steel in the United States for the remainder of the year. A careful canvass has been under way meanwhile, and on June 6 the War Industries Board issued an order putting the control of steel distribution in the hands of the Director of Steel Supply. The order provided that no further shipments of iron and steel should be made except on priority orders. A plan of allocation was announced at the same time, providing for steel shipments—first to plants, Governmental and private, making war material; second, to manufacturers of so-called essential products on the preference list of the Priorities Committee, and third—assuming some surplus remained—to other consumers under written permits from the Director of Steel Supply. As considerable steel has been going to concerns not on war or essential work, the new order makes it certain that for an indefinite time little or no steel will be received by some plants that are now running with full or partial forces. While it is quite certain that various users of pig iron and of finished steel who have had full or partial supplies up to this time will get none in the remainder of the year, no information can be had as to their identity, for no man in Washington has such information. The fact is that no accurate estimate exists, or can be made, of the Government's steel requirements. As late as June 10 various departments sent to the Director of Steel Supply additions of not less than 3,000,000 tons to the estimates previously submitted, and the programs of the Shipping Board and the Ordnance Bureau are still expanding.

Eighty-Five Per Cent. of Steel for War

One estimate that has been given official sanction is that the Government will take at least 85 per cent. of the output for strictly war purposes, so that after all allocations are made to the second or preferred list no surplus would be left. Yet it has been officially intimated that there may be from time to time consider-

able quantities of iron and steel for general consumption. The automobile industry has asked how much steel it may expect, but no official answer has been given. Requests have poured in upon Washington from other industries, but in reply to all these urgent appeals no information has come from official sources as to whether they will have much, or little, or no steel from this time forth. The fuel administration and the War Industries Board have refused to make any list of non-essential or less-essential industries.

The plan appears to be, through the quiet working out of the new priorities régime, under a revised list of essential industries which will be sent to the steel manufacturers to give certain industries a 100 per cent. supply of steel, and to make but small allotments to others, or in some cases leave them without any steel.

The Government is contemplating little new construction in iron and steel. Some extensions are under way, but wherever a new blast furnace is permitted the Government requires that byproduct coke ovens shall be built and an agreement made to turn over to the Government the toluol and other byproducts used for making explosives. The Director of Steel Supply believes it is not necessary to consider further construction of steel mills or blast furnaces until the coke supply has increased to a point permitting the operation at maximum capacity of all existing blast furnaces. Today the coke situation is still "the neck of the bottle" and car supply is the crux of the coke situation. There have been unwarranted delays in the placing of the 100,000 cars the Government is ordering, as well as of new locomotives, and there is serious danger that the coal situation of last winter may be repeated because new cars and locomotives will not be ready to haul the coal to market.

General Users to Have Steel Late in Year

It is practically the unanimous opinion of steel manufacturers that later in the year steel will be available for general uses over and above the requirements of war. One cannot conceive how all the steel rolled from an output of ingots likely to total 43,000,000 tons this year can be absorbed by war and the so-called essential industries. The Emergency Fleet Corporation and the War and Navy Departments, as well as the various missions from allied countries stationed at Washington, have plainly made their estimates high. It is a question if they can use within the time stated all the steel they have asked to have delivered this year. The Emergency Fleet Corporation is plainly creating a reservoir of steel, to guard against any possibility of shortage in the coming winter. Meanwhile, some industries must go without steel that this accumulation may be made.

Shipbuilding Requires Huge Tonnage

A prediction was recently made by Chairman Hurley that the nation's shipbuilding industry would be capable of turning out 13,518,000 dead-weight tons of ships in 1919, and the statement seems entirely reasonable in view of the present tremendous expansion going on under the direction of Director General Charles M. Schwab of the Emergency Fleet Corporation. These figures represent more than the output of England in five years before the war.

One of the great problems of the Shipping Board is to provide sufficient turbines and boilers for all of the ships it will build. New turbine plants are in contemplation, and scores of shops are being given contracts for boilers. To give such yards as Hog Island and Submarine Boat all of the fabricated steel they need, Mr. Schwab has persuaded a Pennsylvania company to build two new fabricating shops, which will increase the speed in assembling fabricated ships.

It takes about one ton of steel for every three tons dead weight of shipping, so on this basis the shipyards next year will need between 4,000,000 and 5,000,000 tons of steel to carry out Mr. Hurley's program of 13,518,000 tons of ships. This is nearly 15 per cent. of all the steel that the country today is able to produce.

Pig Iron Depends on Coke

The pig-iron trade is in a disturbed state because the Government has not been able to determine how large the war requirements of foundry iron will be. A survey is being completed, and the results, as far as disclosed, convey little comfort for the so-called nonessential industries. Concerning steel-making grades, basis, Bessemer and low phosphorus iron, there is no argument. The Government needs all and is taking all. Many steel plants could use more basic and Bessemer grades than they are able to get, therefore the production of steel-making iron rather than foundry iron is likely to be increased.

Plan Now for Future Trade

You gentlemen are welded together to do business in a collective way, especially in foreign countries. This seems a very wise method so far as marketing is concerned. Has it occurred to you that it may be necessary, in self defense, to practice collective buying as well as collective selling? Before the war Germany practiced collective selling to a wonderful extent. After the war she will need enormous quantities of raw material obtainable in foreign countries, and I would not be surprised if she were to introduce collective buying. Then, when the buyer representing German manufacturers goes into the market to buy hides, for instance, the buyer would bid for a cargo, whereas if 15 or 20 different buyers went to Brazil to buy hides they would be competing one with the other and of necessity buying in small lots. Collective buying means buying in enormous quantities on the most favorable basis. By this method the distribution would take place in South America, whereas in the other the distribution would take place in Germany. In the one case 15 or 20 shipments, taking high freight rates, would be made as low as could be made.

To my mind, one of the first problems our manufacturers must face after the war will be how to keep our enormous manufacturing capacity fully employed. I am quite sure that a careful survey of the manufacturing industries will show that if these plants are run anywhere near their maximum capacity we will have remaining, after supplying the entire wants of our home people, a large surplus which will have to be sold, if sold at all, in so-called foreign markets.

Another subject which should receive most careful consideration is the condition we are going to find the

central powers in after they have been defeated. To my mind, it would be a very grave mistake to plan our future on the thought that the central powers will be impotent. To play the game in that way would be to play the game as they will want us to play it. Evidence is arriving in this country that the Germans are planning to make use of Spain, Holland, Denmark and Sweden, where they will manufacture goods for distribution in countries where merchandise made in Germany will find an unwelcome reception.

It is hard to escape the thought that commercially the central powers would be better off today than they were previous to the war if an immediate peace treaty could be arranged, for the very good reason that in reorganizing the different peoples of disintegrated Russia Germany will be the controlling element. Whether the different peoples are organized under an autocratic, democratic, socialistic, or some dependent form of government, we may depend on Germany to bind each one of the different countries tight and fast to a commercial treaty made in Berlin; in other words, the central powers will become the manufacturing plant for 175,000,000 people living in Russia, and Germany will have the full benefit of the entire raw products from one-sixth of the earth's surface. In Siberia alone there are now uncovered more than 175,000,000,000 tons of coal. Enormous findings of iron ore, the best platinum mines in the world, to say nothing of large quantities of copper and other metals, are there. She also has within her borders one of the richest wheat territories in the world. If a treaty should be arrived at between the central powers and the allies tomorrow, Germany's wonderful opportunity will be in the east and not in the west.

Grave Danger in German Control of Russia

Can you doubt for one single minute that Germany is at this present moment engaged in organizing the Ukraine, Poland, Courland, Finland and even Greater Russia? Within the past week an article appeared in the New York papers telling us that German soldiers were fighting side by side with the soldiers of the Ukraine to put down some revolution. How long will it be before the soldiers of Poland, or Courland, of Finland and of Greater Russia will be fighting side by side with the soldiers of Germany? If the reports we are getting from Russia are true, the peasants have not planted more than 50% of the usual crops outside of the Ukraine. This means starvation in many of the large districts. They will undoubtedly need help; will they get it from the Germans or from the allies? If from Germany, what will be the German price? Will it be soldiers in exchange for material help, or will they prefer to starve? I have no means of knowing what this country is going to do to relieve the Russian situation, but one thing is inevitable—if Russia is reorganized by Germany we shall have to prepare to defeat not only the German armies, but the Russian armies as well.

"From Berlin to Bagdad" has been the dream of Germany for many decades. At this present moment, if it were not that England is at Bagdad and in Mesopotamia, the way would be almost clear, but if Germany reorganizes Russia there will be more ways to get into Asia than from Berlin to Bagdad. We must always remember, in considering the Asiatic question, that the country that controls the commerce of Asia will be the leading commercial country of the world. That honor has been held by England for years, and it is my best thought that from this fact springs the bitter hatred Germany has for England. It seems to me that steps should be immediately taken to checkmate Germany in reorganizing Russia. First, it will be against the world's interests to permit Germany to control the commerce of Russia. Second, it would be little short of foolhardy to permit Germany to have free access to the raw materials of Russia. Germany should be prevented from enjoying the fruits of her wonderful Russian victory, even though we have to invite Japan and China to come clear through to Petrograd. My great fear is that we will delay, and delay, and delay, as we have delayed with other important problems, until it is just too late. If we delay long enough Germany will organize the Ukraine, Poland, Courland, Finland, Greater Russia and even Siberia, to adopt her methods, her ideas and her wishes. Then it will be too late to bring in Japan and China, because we will find enormous armies manned mostly by Russian soldiers. A way ought to be found, and that very shortly, for Japan and China to go to Russia, not for conquest, but for the good of Russia.

In conclusion, I have one thought to which I desire to give emphatic expression. It is this:

"If we are not better prepared for peace than we were prepared for war, then God help us!"

Protecting the Panama Lock Valves Against Electrolysis

Corrosion Between Opposing Metals Soon Set in, So Protective Coatings Were Applied and Wood Separators Used

By R. H. Whitehead

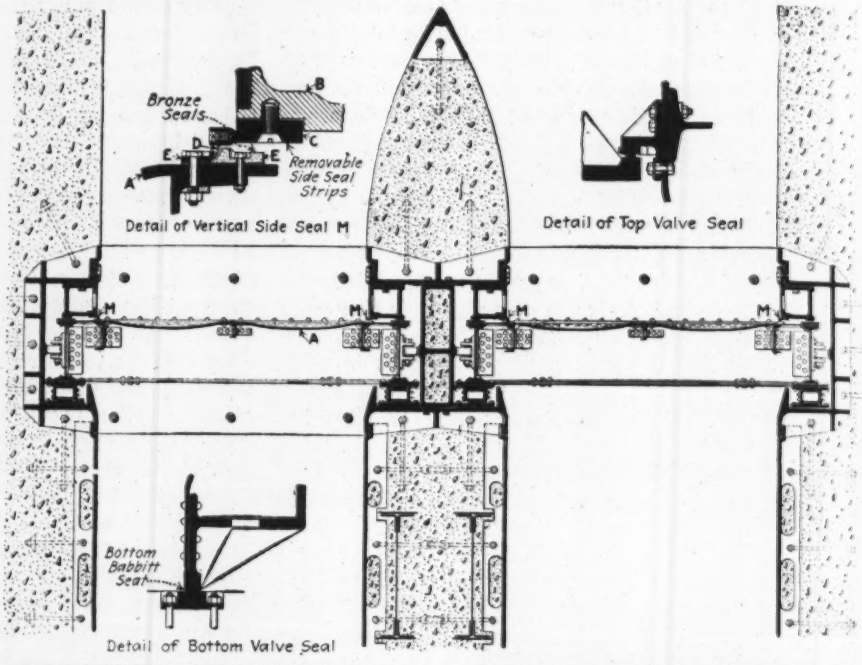
Formerly Superintendent, Pacific Locks, Panama Canal; now at Sperry Building, Brooklyn

ELECTROLYTIC corrosion acting in an unexpected manner caused serious damage to the valves in the Panama Canal locks and threatened to put them out of service in a period much shorter than that for which they were designed. Fortunately, the corrosion was discovered in time to prevent its continuance. There is, however, in the behavior of these valves a lesson which has application to numerous metal structures subjected to the action of salt water.

The flow of water in the 18-ft. culverts of the locks is controlled by sets of valves as illustrated in the accompanying drawing. Each of these sets consists of two valves controlling an opening 8 ft. wide and 18 ft. high, or an area of 144 sq.ft. During operation they are always immersed in more or less salty water. Changes in the original design have been necessary to overcome the electrolytic action which was seriously corroding the valves and their fixed irons. On the basis of the results observed, changes have been made for similar conditions for the valves now being installed on the new locks at Chemulpo, Korea, by the Japanese Government.

In December, 1914, the floating caisson was installed for the first time at the lower end of the Miraflores Locks and the east chambers were pumped out. An examination of the valves and fixed irons was made

and they were found in good condition, although there was some rusting of the valve plates, rivets and of the removable side seal steel strips, but no heavy pitting or corrosion of the fixed iron castings was noted. The east chambers were originally watered in January, 1914, so that the valves and fixed irons had been submerged about eleven months prior to examination. At that time, it was considered that it would be more economical to replace the valves with new ones, on the basis of 10 years' service without painting, than to remove the valves and paint them yearly. During January and February, 1915, the west chambers at Miraflores were pumped out and examination made of the valves on that side. This side had been watered in October, 1913, and the valves and fixed irons had therefore been submerged for about fifteen months. Complete failure of the original paint had occurred, and some of the valves were found to be considerably pitted, with the rivets partially eaten away in some cases. The removable steel side seal strips were found badly corroded on the downstream side but in fair condition where they came in contact with the bronze seal. It was plainly seen that the valves would not give 10 years' service as originally figured, without overhauling, and it was decided to coat with Bitumastic solution and enamel nine of the valves, under a five-year guarantee from the contractor.


Bronze Seals
Removable Side Seal Strips
Detail of Vertical Side Seal M
Detail of Top Valve Seal
Bottom Babbitt Seat
Detail of Bottom Valve Seal

VALVE CHAMBER ON PANAMA LOCKS AND DETAILS WHICH WERE CORRODED BY GALVANIC ACTION OF SALT WATER

It was discovered at that time that the corrosion was principally due to galvanic action caused by the presence of different metals—lead, babbitt, bronze, brass, steel and iron—in salt water. It was found that galvanic action could be detected by placing samples of the different metals in salt water and connecting them to the terminals of an ordinary direct-current milli-voltmeter. In all cases of the above metals, the steel corrodes away to the other metals, and the iron to all the other metals excepting steel. The only attempt made to nullify the galvanic action in the original installation was the placing of nine electrodes on the lower valves at the Gatun and Miraflores Locks, as it was not expected that the salt water would find its way to any great extent into the upper levels. However, Miraflores Lake has become partly salt, due to the salt water coming up through the locks. Also, water does not necessarily have to be salty to cause this action, as the presence of acid, such as exists in the waters of Gatun Lake, also affords favorable conditions for galvanic action.

The use of Bitumastic solution and enamel on the valves removed was determined on only after considerable experimenting. Some form of insulating preparation was required. Various paints and preparations were tried out by application to a steel bar, which was immersed in salt water in company with a dissimilar metal. Readings on a milli-voltmeter connected to the two indicated when failure of the preparation occurred. None of the paints applied stood this test for more than seven days, but Bitumastic showed no signs of failure after a period of several months. It appeared that protective measures at this time were required on the valves only, and that only the side seal strips would require renewing every three or four years, the fixed irons otherwise being in such condition that no protection seemed necessary.

The west locks at Gatun, which were watered for the first time in September, 1913, were pumped out by the floating caisson in July, 1915, the valves being submerged for a period of 22 months before examination. They were found to be in about the same condition as those removed in February, 1915, at Miraflores. The east locks, which were first watered in January, 1914, had the caisson installed in September, 1915, or a period of approximately twenty months, and the valves were also in about the same condition.

On the basis of the poor showing of paints applied to the submerged portions of the lock gates at Miraflores, a contract was entered into with the American Bitumastic Enamels Co. to coat with Bitumastic all of the lock gate surfaces at Gatun and Pedro Miguel, for $58,100. It was also decided to coat all rising stem valves at Gatun with Bitumastic solution and enamel, under a five-year guarantee from the contractor, at a cost of $40 per valve, not including the cleaning of the valves. These contracts were carried out at Gatun.

In January, 1916, the two lower valves in the center wall at Pedro Miguel were removed, and in February, 1916, the corresponding valves at Miraflores were re-

moved. In order to remove the valves, it was necessary to install bulkheads at the lower end of the center wall and pump out the lower portion of the culvert with pumps designed for that special purpose. The valves had been immersed for approximately two years and four months, and had not before been inspected. Inspection showed deterioration not only of the valves, but of the fixed irons as well, due to galvanic action. The bottom babbitt seat on which the valve rested had set up an action with the bottom of the valve, to such an extent that it was necessary to plane off the bottom of the valve. Obviously, this was only a temporary cure, and it was necessary to remove the cause. Accordingly, the babbitt was removed and wooden seats of greenheart were placed in the fixed irons. The removable side seal strips of steel previously referred to had been so badly eaten away by action with the bronze seals on the valve that replacement was necessary. In fact, tests on certain other valves showed that the leakage had increased to nine times normal in a period of about six months. This was caused by the steel strips being so badly eaten away that the seals no longer came in contact with them. It was decided to replace the steel strips with strips of lignum vitae, an excellent wood for the purpose.

Fixed Irons Also Affected

The lead used in calking the fixed irons and for leading-in bolts had resulted in galvanic action which had started to eat the fixed irons in its vicinity. This lead was replaced with cement. Zinc electrodes were placed at the bottom of the bronze seals to assist in overcoming action between the bottom of the valve and the seals. All parts of the valves, with the exception of the bronze seals and rubbing surfaces, were then coated with Bitumastic solution and enamel. As the fixed irons were made of cast steel and cast iron, in order to overcome action between these metals they were also coated with Bitumastic solution and enamel, under a five-year guarantee from the contractor, at a cost of $30 per valve, not including the cleaning.

The bearing surfaces, including principally parts in connection with the roller trains, could not be treated with Bitumastic. At a cost of $25 per valve, pipes have been placed leading from the operating tunnel to below the roller trains in the culverts, with the intention of forcing crude oil through these pipes, in the expectation that when this oil rises through the water it will come in contact with the rollers and bearing surfaces and adhere to them, lubricating them and protecting them from further corrosion. The upper parts of the lock gates at Pedro Miguel have been coated with crude oil, by allowing the water to rise and fall in the chamber and pushing the oil against the gates. This, and experiments on a small scale, indicate that the plan will be successful.

The roller train rods and valve stems which pass through the water-tight stuffing boxes of brass showed considerable signs of corrosion, and at the present rate will require renewal with better materials in about three years.

Compact Concreting Plant Builds St. Paul Station

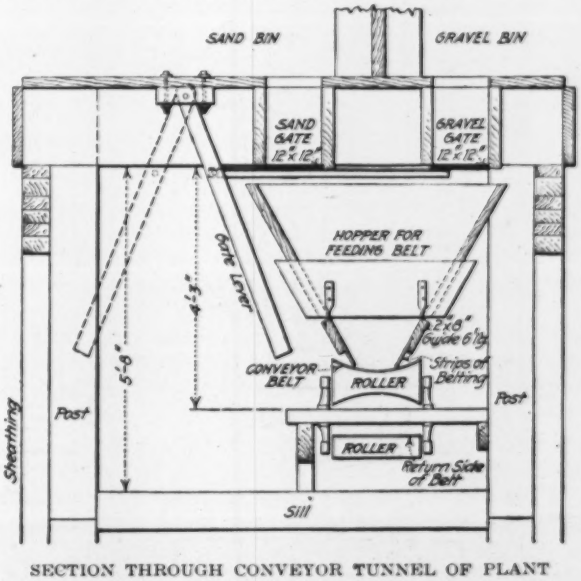
Bins Are Fed by Belt Conveyor and Charge Mixer Through Measuring Hopper—Concrete Spouted from Tower

CONSTRUCTION of the foundations for the headhouse of the new union station at St. Paul is now in progress. Its site is a city block which has been cleared of most of the old buildings. The piling is finished and concrete is being placed for the pedestal footings and side walls.

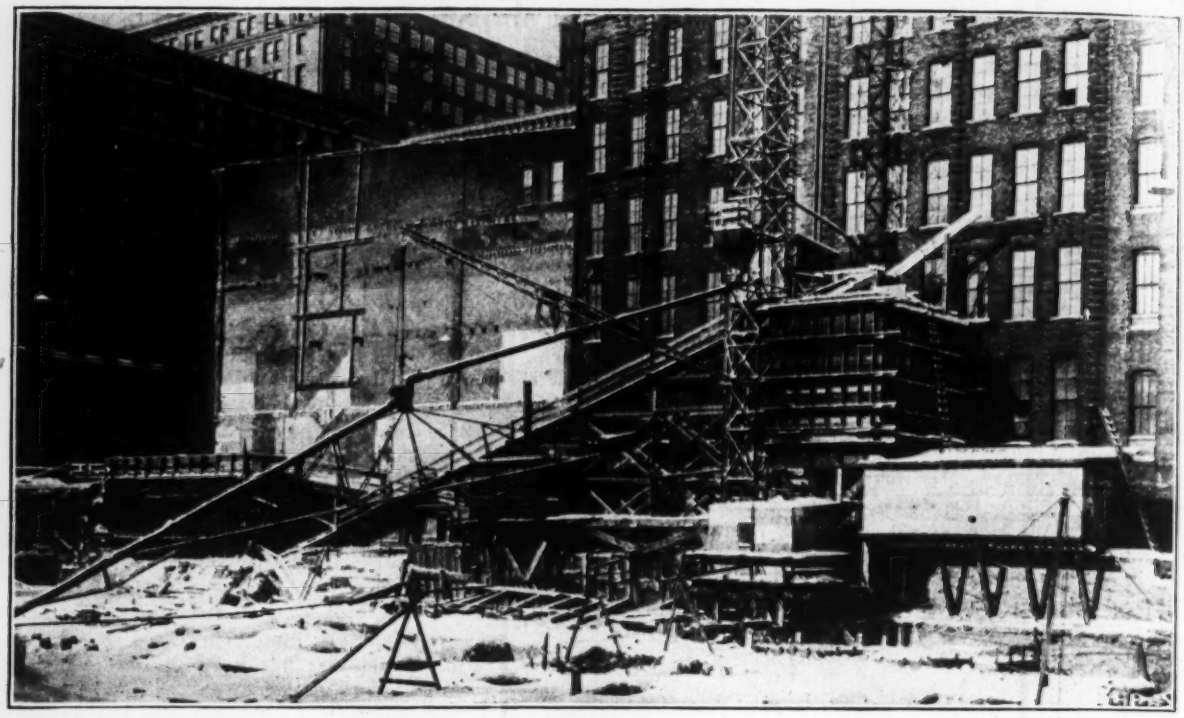
The concreting plant consists of a 1-yd. mixer serving a 160-ft. steel elevator tower having a chute supported by a boom. This feeds a counterweighted chute which is mounted on a truss suspended from the boom.

This plant is located at one side of the site, and the chutes can be swung so as to cover the entire area, 185 x 300 ft. Part of the distribution, however, is done with 1-yd. buggies. Over the mixer are storage bins for sand and crushed stone. These are supplied by a belt conveyor 150 ft. long.

Concrete materials are stored in the basement of one of the old buildings that have been torn down to make room for the erection of the railroad station. The flooring was strengthened to carry wagons and motor trucks, which drive in from the street and dump their contents through traps. This floor or platform serves also as a landing for an inclined roadway to the bottom of the excavation. Beneath the storage basement, which is 12 ft. high, is a timbered tunnel 6 ft. high and 7 ft. wide, for the belt conveyor, its driving plant and the loading chutes. The belt is troughed and the chutes deliver the material at its center through 6-in. slots. These slots have blinders of old belting on each side to hold the material in place until it has acquired the motion of the belt. In this way the scattering of small stone is eliminated. The belt has an inclination of 18° 20′, or about 1 on 3.



SECTION THROUGH CONVEYOR TUNNEL OF PLANT

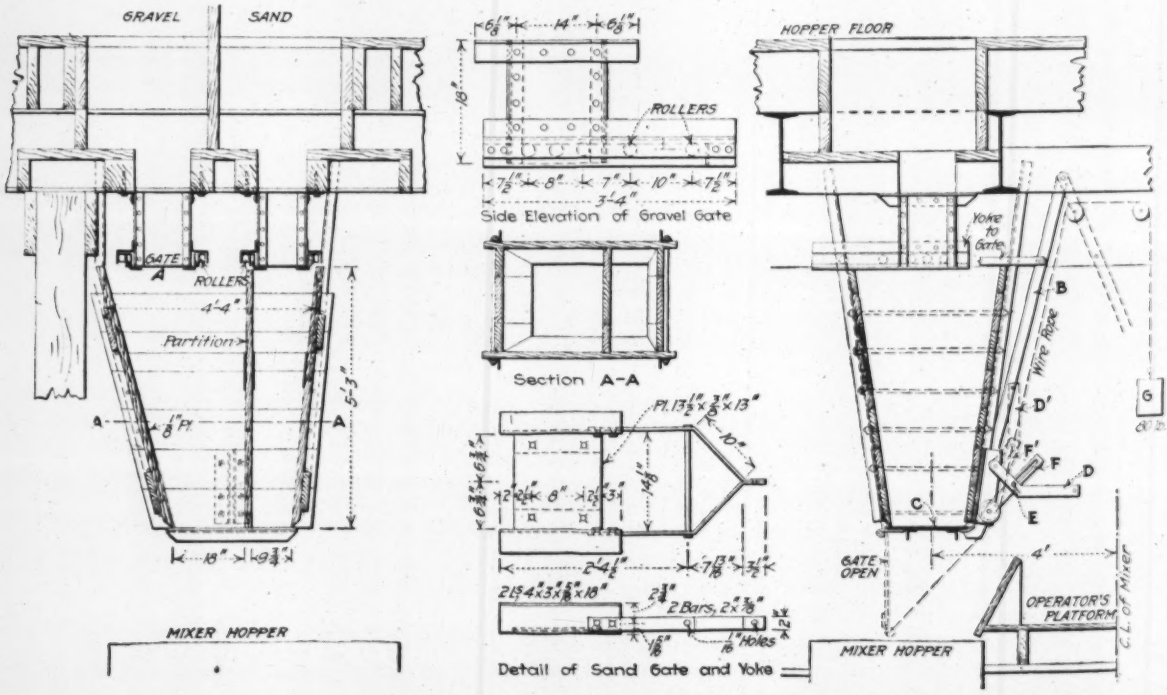


THIS CONCRETING PLANT SERVES FOUNDATIONS OF HEADHOUSE 185 x 300 FEET, FOR ST. PAUL UNION STATION

and with a speed of 170 ft. per min. it carries about 60 tons per hour.

A measuring hopper under the elevated bins delivers the proper proportions of aggregate to the mixer hopper. This is so constructed that the aggregate fills in until it reaches the bottom of the bin gates, and the flow then stops automatically. This arrangement made it necessary to adopt slide gates for the bins. To make these work more easily, each gate has a Z-bar guide riveted to each side, and one leg of this rides on rollers carried by another Z-bar on the side of the bin.

When such gates are closed by pushing, there is likely to be trouble due to stones being caught between the slide and the side of the gate and on one side



CONCRETE FROM MEASURING HOPPER FED THROUGH ROLLER SLIDE GATES, DISCHARGED THROUGH DROP GATE

of the center line. This causes the gate to slue and bind in the guides. In this case the gate is opened by pushing and closed by pulling on a yoke which is attached to both sides of the slide. This gate is shown at A in one of the drawings, and is operated by the hanging lever B

A hinged drop gate C closes the bottom of the measuring hopper. The hopper is lined with ¼-in. steel plates, and at the bottom the wood sides are beveled so that only the steel plates come in contact with the gate. This eliminates binding due to material clinging to the gate as it shuts.

As the aggregate for each batch weighs nearly two tons, the drop gate is fitted with a latch that is strong and foolproof. To release this gate the latch lever D is raised. A bolt E in this lever works in a slotted hole in the latch F, throwing the latch over and disengaging the catch. A counterweight G helps the operator to close the gate when the load is discharged, and by slamming down the latch lever the gate is again locked. By means of ropes leading to the working platform, one man can operate the sand and gravel slide gates, the drop gate, the water valve and the charging and discharging levers of the mixer.

The contract for the station is held jointly by Morris, Shepard & Dougherty and the George J. Grant Construction Co., St. Paul. The arrangement of the plant and the details of the measuring hoppers were designed by A. W. Longbotham, designing engineer for the latter company. W. C. Armstrong is chief engineer of the St. Paul Union Station Company.

Practice in Assessing Pavement Costs Determined

Questionnaire Sent to Numerous Cities by the New York State Conference of Mayors Brought Divergent Answers

THAT the entire cost of the original pavement is assessed upon the area benefited; that the entire cost of repavement is borne by the city; that the amount of assessment upon the frontage is limited to the actual benefit; and that pavement at street intersections is quite generally paid for by the city, are some of the conclusions drawn by Nelson P. Lewis, chief engineer of the Board of Estimate and Apportionment, New York City, in discussing a questionnaire sent out by the Conference of the Mayors of the State of New York to determine standard methods of handling municipal problems. In opening the discussion before the mayors' conference at Newburg, N. Y., on June 11, Mr. Lewis pointed out that considerable divergence of practice exists in the country in handling such problems, and that the answers to some of the questions were so meager that it is impossible to arrive at any conclusion. The questionnaire was sent to about 200 cities, and included 23 questions relating to every phase of street improvement work. While it was incompletely answered by many of the cities, it still gave enough information on certain of the subjects to form conclusions as to the common practice throughout the country.

The questions covered, in addition to those given above, such subjects as, who determines the area of benefit when other than abutting property is assessed; what property, if any, is exempt from assessment for local improvements; who pays the cost of paving in front of exempt property; the term of years over which installment payments extend; and the amount of paving which the street railway companies have to do around their tracks. A brief abstract of Mr. Lewis' discussion of the answers follows:

The important question of how the original pavement in any street is paid for, and the related question of how the cost of renewals or repavement is met were reported upon by 163 cities. A tabulation of the results showed that in 73 cities the property benefited pays 100% of the cost, in 24 cities 66%, in 15 cities 50% and in 25 cities none of the cost. On the question as to how repaving is assessed, in 70 cities the property benefited is assessed none of the cost, in 39 cities 100%, in 16 cities 50% and in 15 cities 66 per cent.

The limit of amount of assessment with reference to property values was given by 46 cities, but there was such diversity of usage, extending all the way from the entire property value to 5% of the value, that no valuable conclusion can be drawn. Twelve cities limit the assessment to the actual benefit, eight to ½ the value of the property, five to ¼ the property value. On the question, as to who shall determine the area of benefit, twelve cities leave this matter to the council, seven to the city engineer, six to assessors designated by various names, and the remainder employ various other methods.

Generally speaking, United States Government property, state property, city property, county property, schools and churches are exempted. Forty-one cities reported that there are no exemptions, but admitted that they have trouble collecting taxes or assessments on United States Government and state property. Out of 91 cities reporting, 63 stated that the city pays the entire cost of paving in front of exempted property, while in the other cities it is distributed in various ways.

The inquiry as to how the cost of paving street intersections is paid shows less variation than do most of the others. Fifty-nine per cent. of the 131 towns reporting state that the city pays all the cost of intersections, while 30% report that the property owners pay the entire cost.

The variation in the policy as to instalments, the number of instalments allowed and the rate of interest charged is very great. No less than 32 different kinds of replies have been received from 121 towns. Generally speaking, they divide on the ten-instalment plan and the five-instalment plan, 66 towns having reported for ten instalments, while 25 reported for five instalments.

The practice of requiring railroad companies to lay and maintain pavements between their tracks and rails and 2 ft. outside of the outer rails appears to be quite general; 92 of the 150 towns stating this as their policy. Maintenance of the pavement for 1 ft. outside of the rails is required in 16 towns, and 15 towns call for the maintenance of the pavement 18 in. outside of the rails. One city, Philadelphia, reports that for several years past the Transit Co., controlling all of the surface railroad tracks, has contributed an annual sum beginning at $500,000 and increasing $50,000 a year until it reaches $700,000; this to be paid in equal monthly instalments

to compensate the city for the maintenance of pavement between and along their tracks.

If the large majority of replies to particular questions may be considered as determining policies prevailing, these may be briefly stated as follows: The entire cost of original, or first street improvement, is assessed upon the area benefited. The entire cost of pavement renewals is borne by the city. The amount of assessment upon the frontage is limited to actual benefit, with specific limit in a number of cities to ½ of the land value and in some cases to less than one half. The district of benefit, where the assessment extends beyond the frontage, is determined by council, but the number of towns reporting is too small to justify calling this a general policy.

Exemptions from assessment other than to Federal, state and city property, are granted in no consistent way, not even in the same city. Even where it is said there are no exemptions, it is not unlikely exemptions can be obtained if claims are effectively presented and pushed. Pavement at street intersections is quite generally paid for by the city although a substantial number of towns assess the entire cost. Instalment assessments are quite generally provided for, the number of payments usually being 10, with interest at from 5 to 7 per cent. Street railway companies are generally required to pave and maintain the space between their tracks and 2 ft. outside.

Uniformity of practice throughout the country can hardly be expected, nor is it, perhaps, to be desired in cities of greatly varying sizes. Many of our cities are now undertaking great enterprises involving large expenditures. They are also disposed to adopt policies which a few years ago would have been denounced as paternalistic or socialistic. Many of these policies have probably come to stay, and during the period of readjustment at the end of the present war our cities will be obliged, it is quite likely, to go even further than they have in these directions. The annual budgets for administrative purposes will increase, and it will be necessary to curtail such expenditures as are represented by contributions to what are commonly called local improvements. The principle of assessing the cost of street pavements and perhaps that of pavement renewals will probably have to be adopted more generally than it has been, whether such assessment be confined to the frontage, or spread over large areas in order that the borrowing power of the cities may be conserved and their annual tax budgets devoted more largely to activities and enterprises which are unquestionably of general benefit.

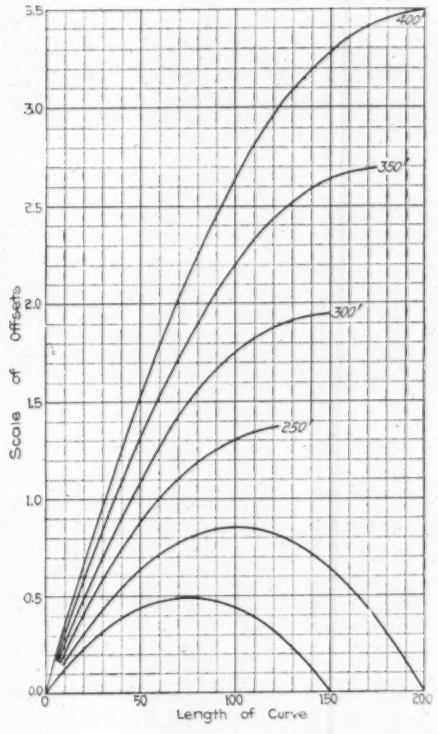
Main Items in Railroad Budget Allowances

Additional yard tracks, sidings and industry tracks constitute much the largest item of additions and betterments approved by the railroad administration in the railroads' budgets. The total for the item is $98,661,553. Shop buildings, engine houses and appurtenances are second in point of size, with a total of $61,979,476, while additional main tracks come third, with $47,471,002. Some of the other larger items are bridges, trestles and culverts, $38,035,762; rails and other track material, $31,556,115; freight and passenger stations, office buildings, etc., $22,940,636.

Diagram Helps in Laying Out Railroad Curves from Long Chords

By H. N. Gahan
Penticton, B. C.

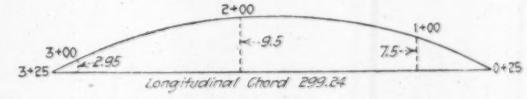
THE accompanying diagram I have found very useful on railway survey work. It enables the user to lay out a simple railway curve by means of offsets from the long chord, where great accuracy is not required, such as in heavy brush or in swampy land. The diagram is



for a 1° curve; for other curves the offset should be multiplied by the degree of curvature.

The length of curve to which the long chord applies is shown by the curved lines on the diagram. The scale of offsets is read on the left-hand scale.

Following is an example: For a 5° curve, using a long chord of 300 ft., with the beginning of the chord at Sta. 0 + 25, the first offset, to Sta. 1 + 00, being 75 ft. from the beginning of the chord, is 1.5 × 5 or



7.5 ft.; the second offset, to Sta. 2 + 00, being 125 ft. from the end of the chord, is 1.9 × 5 or 9.5 ft.; the third offset, to Sta. 3 + 00, being 25 ft. from the end of the chord, is 0.59 × 5 or 2.95 ft., as indicated in the small sketch.

Philadelphia Departments Promote Conservation

Official letters being sent out by various city departments of Philadelphia bear on their margin injunctions designed to aid conservation. One rubber stamp is used for the declaration, "Food will win the war, do not waste it," and another says, "Don't waste water."

Operation of Grand River Roller Dam Proves Satisfactory

Observations on Behavior of Largest of the Three Dams of Its Type in Country, After One Year's Service

By S. O. Harper

Project Manager, Grand Valley Project, United States Reclamation Service, Grand Junction, Colo.

ONE year's service of the large roller crest dam across the Grand River, built by the United States Reclamation Service as a part of the Grand Valley Project in western Colorado, has demonstrated that the largest example of this comparatively novel type of diversion dam is well suited for the conditions existing in this river. The details of the design of the dam and the construction features were described in two articles in *Engineering News* of July 6 and July 13, 1916. On acount of the limited experience of American engineers with this type of dam, it is believed that the following additional notes on the operation of the dam and other features will be of value.

The structure consists of a concrete weir of 480 ft. net length, with crest 8 ft. above the river bed, carrying seven structural steel rollers. Six of the rollers are 70 ft. long and 10 ft. 3 in. high and the seventh roller, which spans the sluiceway opening, is 60 ft. long and 15 ft. 4 in. in height. The roller crests extend between piers upon which is placed the electrical operating mechanism for raising and lowering the rollers. The piers are connected by a steel service bridge. A view of the completed dam is shown on the cover of this issue of *Engineering News-Record.*

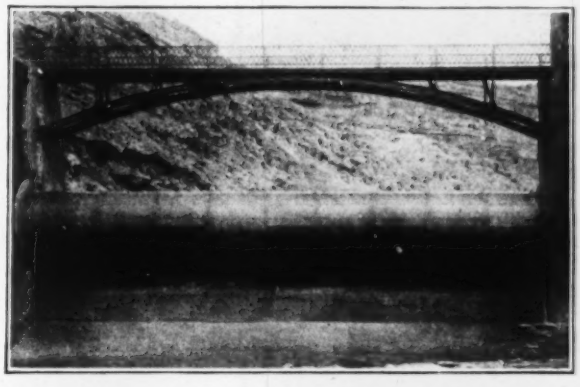
On account of the proximity of the main line of the railroad which traverses the Grand River Cañon at this point, it was necessary to provide a dam which would raise the level of the river during periods of low flow to the height required for the diversion of the required quantity of water into the project canal and, on the other hand, permit the maximum flood flow, estimated at 50,000 sec. ft., to pass without flooding the adjacent railroad track. This requirement called for a type of dam with sufficient flexibility to permit the water above to be held at the same level throughout the irrigation season, regardless of the stage of the river.

The rolling crests consist of structual steel cylinders 7 ft. in diameter to which are riveted curved extension shields braced to the cylinders with struts. The cylinders are provided with a cast-steel rim at each end and the roller moves up and down on a smooth track set in a recess in the pier at an angle of 20° with the vertical. Cogs are provided on the rim which engage in racks set in the piers, preventing any sliding motion of the roller and causing both ends to move at the same speed. Parallel to the track and on the opposite side of the pier recess is a steel guard set in the concrete causing the meshing of the rim and rack teeth.

The operating mechanism for each 70 ft. roller consists of a hoist actuated by a 10-hp., 220-volt, d. c. electric motor, and for the 60-ft. roller a similar motor of 20 hp. Through a series of gears the motor rotates the main 5½-in. chain shaft, to which is forged an 8-tooth sprocket winding up a powerful chain which is attached to the rim at one end of the roller. The rollers are driven at one end only, the hoists for two adjacent rollers being placed on the same pier, and hoist houses are therefore provided only on alternate piers.

The 70-ft. rollers weigh approximately 40 tons each and the 60-ft. roller 53 tons. The maximum chain pull required to raise the rollers is 25 tons for the 70-ft. and 45 tons for the 60-ft. roller. The chains are of special design and are made up of heavy pins and links manufactured from high test steel with an ultimate tensile strength exceeding 80,000 lb. per square inch.

The time required to raise one of the 70-ft. rollers from the lowest to the highest position, a distance of 16 ft., is 15 min. For starting about 35 amp. of current is required and an average of 25 amp. is used during the period of raising. This is equivalent to a power consumption of about 1.5 kilowatt hour.



LEAKAGE FROM 70-FT. ROLLER UNITS IS VERY SMALL

Electric power for operating the rollers is generated in a power plant at the west end of the dam. This plant contains a generating set consisting of a 4-cylinder automobile type gasoline engine direct connected to a 25-kw., 250-volt generator. The generator is used to charge a storage battery which has a capacity of 108 ampere hours, but can also be used to furnish power direct to the motors independent of the battery. The capacity of the storage battery is sufficient to furnish power for the raising of three or four rollers without discharging it excessively, and power from this source is used for the ordinary routine operation of the rollers, as required to regulate the height of the water above the dam. However, when all the rollers must be raised, as during the high-water period or during the winter season, power is furnished direct from the gasoline engine and generator. The nine canal headgates at the west end of the dam are operated by a 3-hp. electric motor.

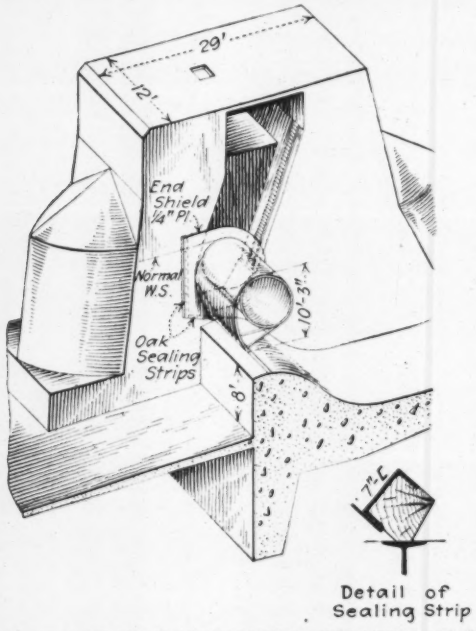
The power plant and operating machinery have proved very satisfactory, and no difficulty has been experienced in the operation of the rollers. The amount of labor required is reduced to a minimum, and one man easily handles all work in conection with the operation of the dam.

The rollers are, as a general rule, raised to the full height only twice each season, once during the high-water period in the summer and again in the winter

to permit the passage of ice. During the remainder of the year the rollers are used to regulate the river and keep the water at the desired elevation. The sluiceway roller, which is set on a sill 5 ft. below the main weir, is raised about once a week during the irrigation season, to sluice out the silt and drift from in front of the canal headgate. The floor of the sluiceway channel is 8 ft. lower than the bottom of the headgate openings, forming a settling basin in which the coarser silt in the water is deposited.

In selecting a type of movable dam, the question of leakage is frequently an important consideration. This was true in the case of the Grand River dam, where it will be necessary at times to divert the entire flow of the Grand River into the project canal. The available information indicated that the leakage through a properly constructed roller crest dam would be very small, and this factor had much weight in influencing the decision in favor of this type, in preference to a wicket or needle dam through which there would be considerable leakage.

In respect to the leakage, it can be stated that the dam has come up to expectations, and that the actual leakage through the rollers is so small as to be practically negligible. The method of securing a water-tight



WATER-TIGHT SEAL OBTAINED IN ROLLER DAM UNIT

seal is shown in the accompanying drawing. The seal between the bottom of the rollers and the concrete weir is obtained by an oak sealing strip which is attached to the lower edge of the extension shield. When the roller is in its down position the weight forces this strip into close contact with the steel sill embedded in the crest of the weir. The seal at the ends, which is somewhat more difficult to make water-tight, is obtained by use of flexible steel shields, the upstream edges of which are lined with wood. These shields are thin and flexible, and the water pressure keeps them tight against the side of the piers. The piers are slightly battered at the bottom, giving a wedging effect as the roller is seated and also allowing clearance after the roller has been raised a few feet.

There has been no occasion up to the present time to divert the entire flow of the river into the canal and, other than the construction of the shields and sealing strips as above described, no particular attention has been given to the matter of making the rollers water-tight.

However, the very small amount of leakage which takes place through the rollers, even without the taking of any special precaution, is shown in the view of one of them herewith. No leakage whatever occurs except at the ends, and the total leakage through this roller is estimated at not to exceed ½ cu. ft. per sec. This leakage could no doubt be further reduced by securing strips of rubber belting or of similar material to the timber strips.

Practically all the leakage seems to take place through the horizontal seal at the bottom of the end shield. The inner edge of this shield is of necessity rigidly attached to the main cylinder, preventing sufficient play to wedge the inner edge of the seal tightly against the pier. It is probably not feasible to eliminate leakage entirely at this point, but it is believed that this leakage can readily be kept below ½ sec.-ft. per roller.

In general, it can be stated that no difficulties worth noting have been experienced in the operation of the Grand River Dam and that it is admirably adapted to serve the purpose for which it was installed. The principal merits of the roller crest type of dam are simplicity and speed in operation, with economy in the use of power and the small amount of leakage through the rollers.

Speedways Partly at State Expense Advocated for New York City at Mayors' Conference

The building of elevated speedways and underground tramways for north and south traffic in the Borough of Manhattan was advocated at the conference of mayors of New York State held at Newburg recently. It was asserted that this is a matter of the most vital importance and cannot be longer delayed, if we are to meet the present situation in a comprehensive and business-like fashion. As this would be a permanent improvement benefiting the public for the next 25 years, it was argued, the burden should not be placed upon the taxpayers in one year, but should be extended over a generation. Furthermore, this improvement must not be considered entirely of local value, it was said, but should have the support of the State government, and the State, as a whole, should be required to pay a portion of the cost. The City of New York pays 70% of the entire taxes of the State, it was asserted, and is entitled to some return in the shape of public improvements. The city also pays a large amount annually to build State highways, and none of this is used within its limits. A metropolitan city such as New York is of great value to the entire State as a market and financial center and should receive, it was said, the unflagging support and the coöperation of the rest of New York State.

Suggested Reforms in Floor-Load Requirements of City Building Laws

Many Codes Specify Excessive Live Loads for Office Buildings, Dwellings and Hotels—Weight of Crowds Overestimated—Garages Should Provide for Loaded Trucks—Rational Live Load Reduction

By R. Fleming
American Bridge Co., New York City

ONE might think that in the building codes of different cities there would be uniformity on the fundamental question of loads to be carried by the floor system, but this is far from being the case. The late C. C. Schneider, wishing to bring about safe and sane practice, gave special attention to floor loadings in his noteworthy paper, "The Structural Design of Buildings" (*Transactions* A. S. C. E., Vol. 54, p. 371, June, 1905). He was surprised at the dissent from his conclusions and the variety of opinions expressed; "a variety," he writes, "corresponding to the vagaries of the provisions of the various building laws."

Shall the Weight of Partitions Be Included in the Live Load?

All building codes specify that the floor system shall be designed to carry the dead load. The partitions of a modern office building are usually thin and can be moved easily. It is a common practice to include them in the live load, especially where liberal assumptions are made for live loads. At a conference of building inspectors a speaker from Minneapolis remarked, "Now we find that the engineers in designing office buildings do not figure on all the actual load, the dead load of a building. For that reason we feel that it would be a pretty good thing to require a liberal live load, because if they do not figure the entire dead weight they are yet safe. That may not seem very logical, but that is the way we find it. Quite often engineers do not figure anything for partitions or floor filling."

It is more logical to prescribe a live load near the actual load and treat partitions subject to rearrangement after the manner of the Schneider specifications:

"For office buildings, 10 lb. per sq.ft. of floor area shall be added to the dead load of the floor for movable partitions."

This clause is embodied in the Grand Rapids and Memphis codes. However, when the live load for office floors is specified at 60 lb. per sq.ft. or over, as in the majority of codes, it is perfectly safe to assume that this figure will cover partitions of wood studding or of hollow tile not over 4 in. thick.

Rival fireproofing concerns are often profuse in their promises to reduce the weight of steel because of the lightness of their floor constructions. Statements of this kind are not always verified by facts. Moreover, it is not uncommon for owners to change their fireproofing after the steelwork is designed. It is excellent practice to assume a figure for the weight of fireproof floors large enough to provide for these chances —say 70 lb. per square foot.

From a tabulation of the codes of 130 American cities it is learned that the live loads on office floors are specified quite variously. Proceeding from the lowest loadings upward, we find that two cities, Milwaukee and Fort Worth, specify 40 lb. per sq.ft.; ten, including Chicago and Cincinnati, 50 lb.; sixteen, including New York and San Francisco, 60 lb.; one, East Orange, N. J., 65 lb.; seven, including Denver and Pittsburgh, 70 lb.; fifty-eight, including Baltimore and Providence, 75 lb.; one, Cleveland, 80 lb.; one, Youngstown, 90 lb.; and eleven, including Boston and Philadelphia, 100 lb. A number of codes are general or fragmentary in their provisions and make no mention of floor loads. It may be noted that the lighter loads are found in the later codes.

The question arises, Why should office floors be figured for 100 lb. in Boston and 50 lb. in Chicago?

The investigations of Blackall and Everett of Boston (*American Architect*, Aug. 26, 1893) are often quoted. The highest floor load they found in 210 Boston offices was 40.2 lb. per sq.ft. The highest average load for ten offices was 29.8 lb. per sq.ft., and in a number of offices it was less than 10 lb. From this and similar studies it seems an extravagance to design office floors for more than 50 lb. per square foot.

To provide for safes and other concentrated loads the New York code has a clause: "Every steel floor-beam in any building erected hereafter used for any business purpose shall be capable of sustaining a live load concentrated at its center of at least 4000 lb." Such a load is needed only in exceptional cases. The Waltham code requires that "provision shall be made on individual floor-beams of all buildings for a concentrated load equal to the distributed load on 12 lin.ft. of the beam in question." With the loads prescribed in most building codes this gives unreasonably high concentrations. The writer suggests that all office floor-beams be designed to sustain a concentrated load of 3000 pounds.

As the ground floor of office buildings is often used for stores or rooms for public assembly most codes specify for that floor a load ranging from 80 to 150 lb. Without much doubt 120 lb. is sufficient, and the 3000-lb. concentrated load is ample here also to provide against loads from safes and the like.

Excessive Loads Used for Dwellings, Hotels and Schools

The live loads for the floors of dwellings present striking lack of uniformity, ranging as they do from 25 lb. per sq.ft. in Fort Worth to 70 lb. in Philadelphia. Milwaukee and San Diego use 30 lb. Several cities—New York, Chicago, Denver and others—specify 40 lb.; Boston, Indianapolis, Pittsburgh, and a long list of others, 50 lb.; still more, including Baltimore, New Haven and St. Louis, 60 lb. The Lancaster code of 1903 calls for 75 lb. and the Savannah code of 1904 calls for 100 lb., but as neither of these codes contains

anything relating to working stresses their prescribed loads need not be taken seriously. A requirement of 70 lb. is absurd, one of 60 lb. is nearly so, 50 lb. is excessive, and 40 lb. is ample.

The heaviest piece of furniture is generally a piano. A Steinway upright weighs 685 lb. and covers an area 5 ft. 2 in. by 2 ft. 5 in. A Steinway parlor grand weighs 775 lb. and covers an area 6 ft. 10½ in. by 4 ft. 10¼ in. Schneider found the weight of a Wernicke bookcase 6½ ft. high to be 170 lb. per linear foot; the ordinary bookcase weighs less. With such figures in mind, the writer suggests 40 lb. for the lower or ground floor of dwellings and 30 lb. for the floors above.

Hotels—The floor loads prescribed for hotels vary from 30 lb. per sq.ft. in Milwaukee to 80 lb. in Cleveland. New York uses 40 lb., Chicago 50 lb., Philadelphia 60 lb. Akron calls for 100 lb. but gives no working stresses. More codes call for 60 lb. than for any other loading. A requirement of 80 lb. for the first or ground floor and 40 lb. for the floors above should meet all needs.

School Buildings—Nearly all codes designate either 60 or 75 lb. per sq.ft. as the floor load for classrooms. Milwaukee calls for 40 lb., Denver and three other codes 50 lb., while for some unknown reason Columbus, Indianapolis and five other codes require 100 lb. It is difficult to see how a crowd of children in a classroom can weigh 50 lb. per sq.ft. "Why require 75 lb. for a classroom when you can only get 30?" Allowing for all contingencies, a load of 50 lb. is ample for design.

Allowance for Weight of Crowds

For places of public assembly the code specifications range from 80 to 125 lb. per sq.ft. New York, Chicago and other large cities call for 100 lb. The assumed loads are often too high because they are based on experiments with weights of crowds made on too limited an area.

Stoney, of "The Theory of Stresses" fame, packed 58 Irish laborers in the deckhouse of a ship, securing an average load of 147.4 lb. per sq.ft. Professor Kernot, of Victoria crowded his class of 16 engineering students into an area of 18 sq.ft.—a loading of 134.7 lb. per sq.ft. and could have squeezed in another which would have brought the load to 143 lb. Professor Johnson of Harvard packed 67 engineering students into an area of 64.7 sq.ft., an average load of 156.9 lb. per sq.ft. These experiments, made 50, 25 and a dozen years ago, are interesting, but it is foolish to design an auditorium for a floor load equal to that obtained by studied packing into a small area. An assumed load of 75 lb. for churches and theaters and 100 lb. for assembly halls should be sufficient for all possible needs.

Some codes make a distinction between auditoriums with fixed seats and those without, using 75 or 80 lb. for the former and 100 to 125 lb. for the latter. Except in churches and theaters fixed seats are removed so easily that the wisdom of this distinction seems doubtful.

For floors used for dancing many codes call for 150 lb. This seems excessive. The vibration caused by dancing is indeterminate, but a static loading of 120 lb. should be sufficient to cover allowance for vibration effects, since it represents an impact addition of 200% to a live load of 40 lb. There can be but little dancing if the room is crowded or the floor loaded to 40 lb. per sq.ft. The Covington code aims to provide for the safety of dance halls by this further provision: "The sanitary guard shall post a notice in every dance hall, showing the number of people that such dance hall will safely sustain without overcrowding," which however is clearly unnecessary, in the light of what has been said.

Certain Cases of Special Loading

Corridors—A number of codes (Detroit, Omaha, etc.) give separate loads for stairs, halls and special rooms. The use of different loadings for rooms and for corridors destroys symmetry in the floor plans by requiring slightly different sizes of beams on opposite sides of columns. Moreover, rearrangement of halls, rooms and stairs, a not infrequent occurrence, renders void the refinements of the previous calculation.

For all practical purposes it is sufficient in corridor computations to take the average load over the whole floor, deducting no openings.

Libraries—Another case of wide variation is found in the floors of libraries, where prescribed loads run from 90 lb. per sq.ft. (Augusta and Richmond) to 200 lb. (Pittsburgh) and 250 lb. (Berkeley, San Francisco and Salt Lake City). It is evident that more information is needed as to the actual loads upon library floors.

Garages—The loadings for garage floors vary from 75 lb. (Evansville) to 150 lb. (Toronto). In several codes a distinction is properly drawn between private and public garages. Rochester, for instance, specifies 50 lb. for private and 100 lb. for public garages. Chicago calls for 40 lb. when the ground area is less than 500 sq.ft., and 100 lb. when 500 sq.ft. or more. From the fact that there are 4,000,000 motor vehicles in use in the United States, every one of which must have a place of storage, garage floors deserve special attention.

Load Data on Motor Vehicles

The heaviest Ford car weighs 1753 lb.; its wheel base is 100 in. The standard Cadillac, with wheel base of 132 in., has a maximum wheel load of 1250 lb., the Winton, with wheel base of 138 in., 1295 lb., the heaviest Packard, with wheel base of 126 in., 1400 lb. A long list of other makes gives wheel bases from 115 in. to 135 in. and maximum wheel loads from 750 to 1050 lb. The standard gage of 56½ in. invariably is used, and slightly more load is carried by the rear than by the front axle.

The writer suggests that the floor load for a private garage be assumed at 60 lb. per sq.ft., that each floor beam be made strong enough to carry a concentrated center load of 2000 lb., and that no garage with a floor area over 600 sq.ft. be considered a private garage. For a public garage designed to store pleasure vehicles only, a floor load of 90 lb. per sq.ft. and a concentrated load of 3000 lb. are suggested.

The motor truck is a disturbing element with respect to floors as well as roads and bridges. These trucks are heavy, and from 60 to 90% of the load comes upon the rear wheels. The 1-ton truck of one maker has a wheel base of 140½ in. and a load of 1110 lb. on each rear wheel when empty and 2430 lb. when fully loaded. The 2-ton truck of the same maker, with wheel base of

153½ in., has a load of 1430 lb. on each rear wheel when empty and 3680 when loaded. The 3½-ton truck of another maker has rear wheel loads of 2530 lb. empty and 6235 lb. loaded. A 5-ton truck carrying full load may have 8000 lb. on each rear wheel. The manager of a prominent firm of manufacturers says:

"May I further state as my individual opinion that a garage should be designed so that it will sustain the largest truck *with its load*, for the reason that in a repair shop trucks are frequently run in fully loaded in order to receive minor repairs, and, furthermore, it is not unusual for a truck to be run into the garage fully loaded in order that it may start out early the next morning. A loaded 5-ton truck will run from 10 to 11 tons in weight. As an offset to these heavy loads, it is of course to be kept in mind that a truck occupies considerable area and, in practice, it would probably never happen that the trucks occupied any less space than 200 sq.ft. per truck."

To provide for these heavy loads it is suggested that a clause be incorporated in building codes similar to the following: "If motor trucks from 1 to 3 tons capacity are likely to be stored, the floor shall be designed to carry a live load of 150 lb. per sq.ft., each beam to be capable of sustaining a concentrated load of 8000 lb. If trucks of 3½ to 5 tons capacity are likely to be stored the uniform live load shall be taken at 200 lb. per sq.ft. and the concentrated load at 12,000 pounds."

Complete Classification of Buildings Impracticable

In the 130 codes examined, about 150 kinds of buildings are mentioned. The classification of buildings in some codes is quite detailed. Seattle gives floor loads for 42 kinds of buildings. The proposed Norfolk code classifies buildings in accordance with their construction into 6 classes and in accordance with their occupancy into 18 grades. Other codes give broad general classifications. That of the New York code is so brief that it will be quoted entire:

"Forty pounds for residence purposes, 100 lb. for places of assembly or public purpose, except that for classrooms of schools or other places of instruction the floor need not be designed for more than 75 lb., and 120 lb. for any other purpose, except that the floors of offices need not be designed for more than 60 pounds."

The reader of the code is supposed to understand that the loads given are minimum loads; a load of 120 lb. cannot be used for a warehouse carrying 250 pounds.

But whether a code be long or short it cannot cover every case of floor loading that may arise. Industrial buildings and buildings for special purposes should have the floor loads assumed from competent knowledge of the uses to which the building is to be put. The San Diego code says: "Buildings not classified in the above table must be designed to safely carry the loads to which they are subjected," which, strictly speaking, is rather meaningless, but serves the purpose of calling attention to the possibility of special loadings and of vibration due to the use of the building. These matters demand the engineer's careful study.

The writer was once consulted regarding steel beams for a stage upon which a trick elephant performed. Building codes and specifications do not give the weight or the wheel base of elephants, but both may be found in a table of "Weights of Men and Animals" quoted by Stoney in the later editions of "The Theory of Stresses." The particular trick elephant weighed about 6000 lb. and at times the load came upon one of his hind feet.

Reduction of Live Load for Girders and Columns

In office buildings, hotels and the like it is improbable and almost impossible that all floors should be fully loaded at the same time. For this reason in designing columns and vertical supports a reduction of live load is permissible. Many codes follow the New York provision which allows columns in buildings more than five stories in height to be proportioned for an assumed live load on the floor next below the top floor of 95% of the specified floor load, on the next floor below of 90% and on each succeeding lower floor at correspondingly decreasing percentages until 50% is reached, which shall be used for remaining floors.

The Chicago code permits the live load on the top floor to be assumed at 85% of the specified floor load, on the floor below the top floor at 80%, and so on until 50%, in designing the columns. Neither New York nor Chicago is explicit regarding warehouse floors, for which little if any reduction should be made.

A number of codes agree with Boston in allowing (except in warehouse buildings) a reduction of 10% of the live load for girders carrying more than 100 sq.ft. of floor, and a reduction of 15% for columns when two floors are carried, of 20% when three floors are carried, and so on to 50 per cent.

Philadelphia determines the percentage of live load to be used for girders, columns or foundations by the formula $100 - \frac{1}{2}\sqrt{A}$ for hotels, hospitals and office buildings and $100 - \frac{2}{3}\sqrt{A}$ for $\frac{2}{3}A$ light manufacturing buildings. Here A is the floor area carried. In San Francisco, Salt Lake City and Spokane, girders are to be proportioned to carry 80% and columns 60% of the specified floor load except for warehouses, stores and libraries, where the full live load shall be used. Tacoma varies in allowing 90% of the live load to be carried on both girders and columns for warehouses and stores.

Dayton, Ohio, and Covington, Ky., allow for girders a live-load reduction of 15%, and for columns a reduction of 5% for the top floor and an additional 5% for each succeeding floor, until 50% is reached for warehouses and 20% for other buildings, which reduced loads shall be used for remaining floors. Dallas and Davenport vary by making 50% the limit of reduction for all buildings.

Duluth, Manchester, N. H., and Portland, Ore., have an elaborate system of live-load reduction on girders and columns dependent upon the class of building and the magnitude of the assumed floor load. Thus for floors of 40 to 60 lb. only 75% of the live load would be used, while 95% would be used for floors of 150 lb. Cleveland and South Bend also fix the ratio of reduction upon the magnitude of the assumed live load. Augusta, Ga., and Shreveport do not allow a reduction where the assumed floor load is more than 120 lb. per sq.ft. and is likely to be permanent in character.

Other variations of live-load reduction need not be mentioned here. Several codes (Atlanta, Birmingham,

etc.) are strangely silent on the subject, yet high buildings with columns proportioned for reduced live loads are found in these cities.

The writer suggests a provision (compounded from the Boston, Chicago and New York codes) as follows:

"The full floor load shall be used in proportioning all parts of buildings designed for warehouses or for heavy mercantile and manufacturing purposes. In other buildings the specified live load may be reduced 10% for girders carrying more than 150 sq.ft. of floor. For columns the load on the top floor may be assumed at 90% of the specified live load, on the floor next below the top floor at 85%, and on each succeeding lower floor at correspondingly decreasing percentages, provided that on no floor shall less than 50% of the specified live load be assumed and that for the lower floor the full specified live load shall be used. No reduction shall be made for any roof load."

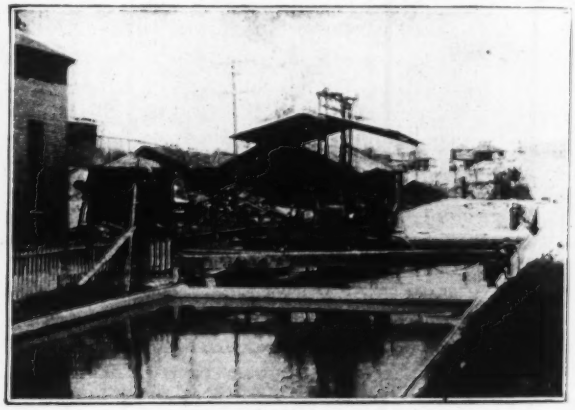
Intermediate Rate Fine-Sand Water Filter Operates Under Vacuum

Silty Water of the Colorado River at El Centro, California, After a 75-Mile Journey in Irrigation Canals, Is Clarified Without Chemical Treatment—Raw Water High in Bacteria

A COMPARATIVELY high rate, for a slow-sand filter, is the end sought in the 3,000,000-gal. daily purification plant nearly completed at El Centro, Calif. An unusually fine sand, operation under vacuum, a combined pump and valve chamber, a provision against earthquakes in the way of a raised lip around the edge of the foundation so that a leak may not soften the underlying clay, and underdrains of building tile which may be flushed quickly by a washout manifold are other features in the plant, which must handle the silty Colorado River water after passing through 75 miles of irrigation canals of the Imperial Valley water system. Yuma discharges the sewage of its 5000 people into the river 8 miles above the headgates of the Imperial Canal and the water is further contaminated in its course through the canal. By the time it reaches El Centro the turbidity often reaches 5000 parts per million, the bacterial count 28,000 per c.c., and B. coli 10 per cubic centimeter.

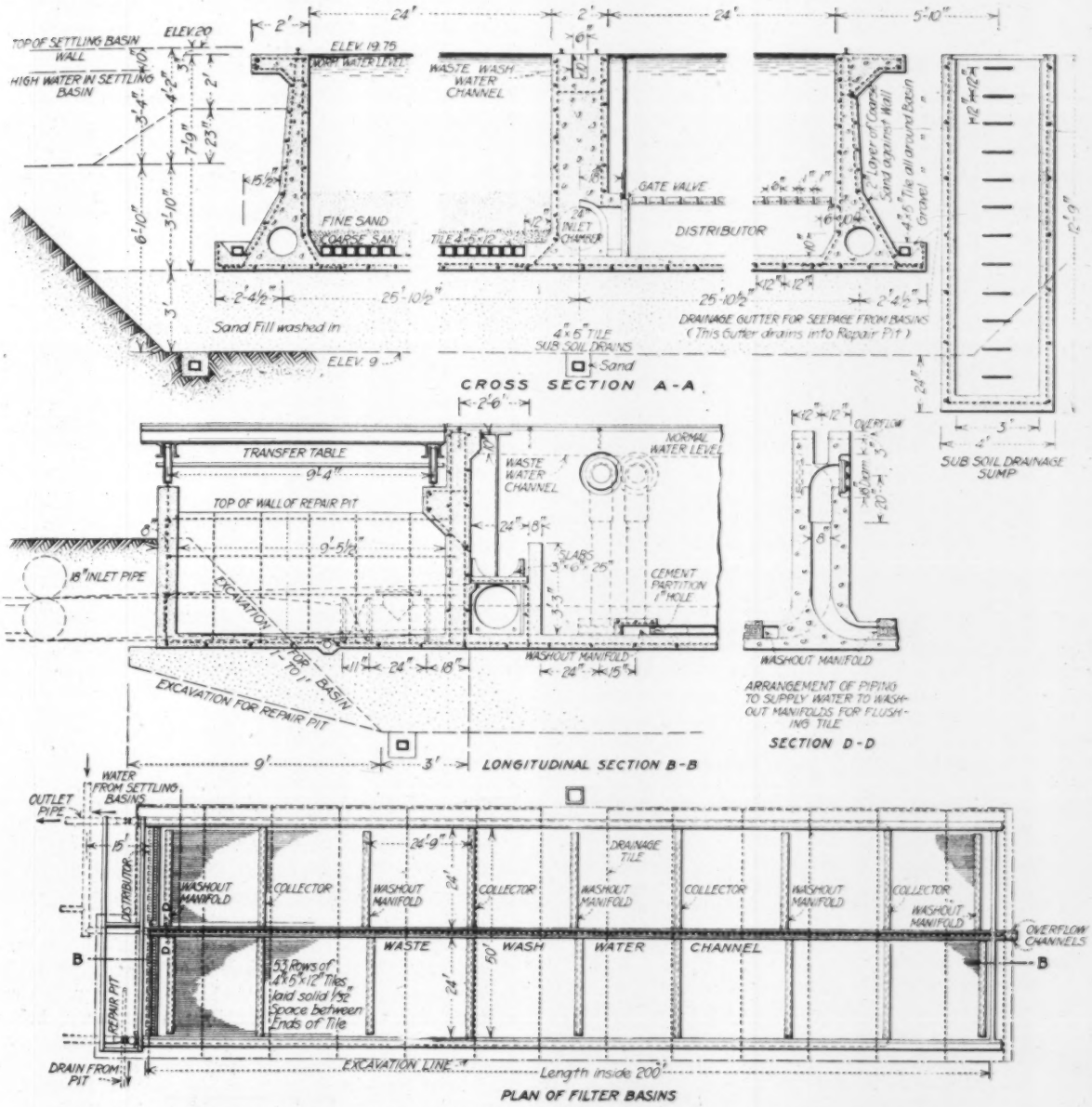
Briefly, the treatment consists in settling in a series of continuous-flow basins to an average turbidity of 60. In this process the bacteria usually increase. The settled water then passes through, either of two filters, 24 ft. wide and 200 ft. long, of the intermediate fine-sand type with a vacuum of from 5 to 15 in. maintained by direct connection with two 1200-gal.-per-minute centrifugal pumps discharging into a 100,000-gal. tank at an elevation of 100 ft. A venturi meter on the tank outlet to the city measures the consumption, which runs as high as 2,000,000 gal. daily, but averages such that one pump is capable of supplying the city except in case of fire. These pumps are driven by 50-hp. distillate engines, but two smaller centrifugals available for emergency and washing out the settling basins are electrically driven.

The last three of the series of settling basins are connected with a pump and valve chamber by three 18-in. 18-gage riveted steel pipes, covered with 3 in. of reinforced concrete. At the intake ends there are tees with upright branches 4 ft. in height, the tops of which are 2 ft. below the normal operating surface of the water to insure the use of a well-settled water for the filters. The outer ends of the tees are closed by gate valves which may be opened to make available the entire contents of the basins. Another set of valves controls the flow into the gate and valve chamber. This chamber has an intermediate floor placed just above the three 18-in. inlets from the settling basins and below an 18-in. outlet to the filter basins. In the center of the floor is a 24-in. flap gate normally open, but closed when the water is low in the basins and the water raised to normal elevation by an 11-in., 1300-gal.-per-minute vertical-lift pump located on this intermediate floor. At such times a constant head is maintained by wasting through three 11-in. vertical overflow pipes in the intermediate floor. The pipes may be replaced by vertical-lift pumps when additional capacity is required.



FILTER-WASHING MACHINE TRAVELS ON TRACKS

Entrance to the filters is into a distributing channel at the end of each filter in the center on a level with the floor. The depth of the filters is 7½ ft. There is a 2-ft. dividing wall, in the top of which is a 6 x 10-in. waste wash-water channel. Filtered water collector pipes of 8-, 10- and 12-in. diameters are placed in the side walls on a level with the floor of the basins, the 12-in. pipe being at the outlet ends. Into the pipes run 4 x 12-in. collector channels across the floors, which are covered with 4 x 5-in. building tile laid with ⅛-in. joints for the entrance of filtered water. A 6-in. layer of sand, passing a ¼-in. mesh screen and retained on a 16-mesh screen, forms the support for 18 in. of quartz filter sand, all of which passes a 16-mesh screen. Further specifications for the sand require that it should carry 20% finer than 80-mesh and 3% finer than 150-mesh. The

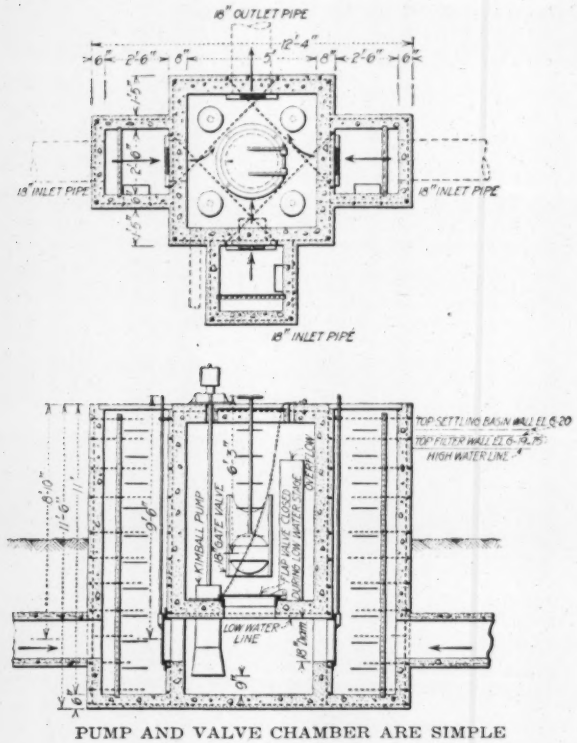


EL CENTRO FILTERS ARE LONG AND NARROW TO FACILITATE MACHINE WASHING

amount finer than 80-mesh should not be less than 15% to effect satisfactory clarification and purification. Normally the water depth over the sand surface is 4½ feet.

For the purpose of flushing out sediment that may collect in the 4 x 5-in. tile on the floor of the basin, ten 8-in. pipes with flanged ells on the upper ends are connected with the 4 x 12-in. washout channels, into which the 4 x 5-in. tile project. By selecting a time when the filter bed is clogged, thereby causing a maximum vacuum on the filter, and removing the flanges one at a time from the upper ends of the 8-in. vertical pipes, the pumping plant can be used to draw a large stream of water from above the clogged filter bed and down through the 8-in. pipe into the 4 x 12-in. washout channel, through the 4 x 5-in. tile, the ends of which are reduced by cement fillers to a ¾-in. hole, into and through the adjacent collectors to the 8-, 10- and 12-in. collector pipes and 18-in. pipe to the pump. The resulting high velocity of the flow through the various channels is intended to remove any sediment that may have collected. The wash water is wasted, the work being performed when the pumps are not in use. In the future when the pumps and 18-in. suction line are continuously in use the 12-in. tees on the outlet pipes can be connected with a pump for washing purposes only.

The filter-washing machine consists of a gantry frame traveling on tracks on top of the filter basin walls; the two basins being served by a transfer of the gantry from one to another by an electrically-operated transfer table. A washing chamber 4 ft. wide, 2 ft. deep and 12 ft. long, containing three 4-ft. circular washing units, is supported on wheels and tracks on the gantry

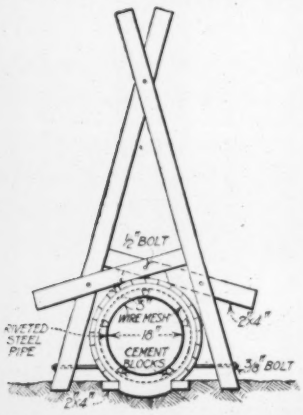


PUMP AND VALVE CHAMBER ARE SIMPLE

frame. The gantry moves the length of the filter, cleaning a 12-ft. strip. Then the washing unit is moved and the other half of the filter is cleaned. The washing chamber has sides and top and ends, but no bottom, the sides being secured at their bottom edges to sliding shoes with curved edges front and back like a snowshoe, which supports the washing chamber on the surface of the filter when in operation.

As in the other installations of this type of washer, the hollow rake teeth extend 8 to 18 in. down into the sand so that the 18-in. layer is washed its full depth. Washing is required every four days and takes two hours for each filter.

While the maximum rate with both of the large pumps running is 16,500,000 gal. per acre per day, ordinarily it will be but one-half that amount. The Calexico plant of this type is now operating at a rate of 14,000,000 gal. per acre daily, and the Yuma plant, which was visited by a representative of *Engineering News-Record* in 1907, and again in 1917, gives satisfactory clarification at rates as high as 29,000,000 gal. per acre daily.



FORMS FOR CONCRETING STEEL RIVETED PIPE

As the El Centro structure had to be built on clay, which absorbs water freely and becomes too soft for a satisfactory foundation, the excavation was carried 3 ft. below the proposed masonry foundation and refilled with local fine sand, which was compacted by flooding. The surplus water was removed through subdrains made of 4 x 5-in. building tile laid in sand in trenches in the clay. The tile all drain into a sump.

The designs were prepared and the construction was carried out by the Blaisdell Filtration Co., of Los Angeles.

Land Computations for Railway Valuation

BY H. H. CARTWRIGHT

Assistant Engineer, Real Estate Department, Nashville, Chattanooga & St. Louis Ry., Nashville, Tenn.

FOR the valuation of land in connection with the Federal valuation of railroads it seems that the basis will be the following equation: The summation of every zone area times its unit value equals the valuation of the land.

Assuming that the carrier or railway and the Interstate Commerce Commission have decided on the limits of each value zone, then the first big task is to compute the area claimed in each zone and to reconcile this figure with the figure found by the commission for that zone.

The Nashville, Chattanooga & St. Louis Ry. has figured each zone in the manner shown by the following example:

Zone 36—Valuation Section 41: Carrier, 68.51 acres claimed. Commission, 23.19 acres allowed, $+a$, 0.92; $+b$, 1.63; $+c$, 1.00; $+d$, 18.30; $+e$, 14.14; $+f$, 10.25; $+g$, —0.67; $+h$, —0.25 = 68.51 acres.

The letters or symbols used throughout the computations indicate the following:

a. Roads or streets on right-of-way excluded.
b. Industrial track right-of-way excluded.
c. Land used but not owned, excluded.
d. Land claimed under charter, excluded.
e. Land owned by holding company, excluded.
f. Land classified as non-carrier; should be carrier.
g. Discrepancies in I. C. C. computations.
h. Figured on wrong valuation section.

The district land office of the commission is interested first in the figure g, so that carrier and commission may have their basic areas equal. Then the carrier of course wants a compact statement of its claims. When a section is finished, a similar tabulation is made as a summary, the four classes of land being set up separately—rural carrier, rural non-carrier, urban carrier, urban non-carrier. Finally the summary sheet is compared with the total area previously reported on the forms used for a rough check of the work.

Iowa Engineering Societies Want License Law

Representatives of eleven societies in Iowa, including state and national organizations of engineers and architects and clubs of engineers, met June 8 at Des Moines to lay plans for the enactment of an engineers' license law. A committee, including one representative from each group, was chosen to draft a bill to be sent to each society for amendment and approval. The committee proposes to meet in September to perfect the bill and to consider means of putting it before the legislature. The law sought would classify engineers by examination, contain provisions for reciprocal license privileges with other states, and be designed to protect the public in getting competent engineering service. C. H. Young, president of the Iowa Engineering Society, is chairman of the committee, and J. H. Dunlap, Iowa City, is secretary.

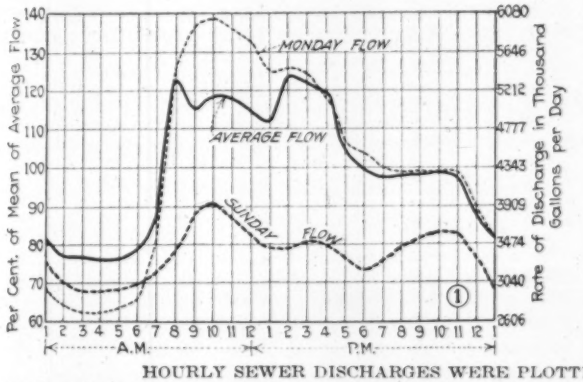
Forecasting Sewage Discharge at Toledo Under Dry-Weather Conditions

Unit Quantities for 1960 Based on Estimating Present Discharge, Correcting Present Estimates by Present Discharge, and Applying Corrected Estimates to Future Conditions

By Watson G. Harmon
City Sanitary Engineer, Toledo, Ohio

BEFORE the Ten Mile Creek intercepting sewer for Toledo was designed a detailed study was made of the present volume of sewage and the probable volume to be dealt with up to the year 1960. The study included sewer gagings, a census of population and industry, a correlation of sewer discharge and census results, and finally the fixing of unit quantities to be used in design.

The Ten Mile Creek district is the one of four natural sewerage districts which demands first attention. Studies for the whole city have been in progress since June, 1916. A general plan has been adopted by the city and approved by the State Department of Health.



HOURLY SEWER DISCHARGES WERE PLOTTED FOR EACH OF THE FIVE MAIN SEWERS

Records for two sewers only chosen as illustrative of results. (1) Manufacturing section, July 3 to Aug. 2, 1916; very dry, hot weather. (2) Residential section, occupied by people of moderate means, Aug. 2 to Sept. 5, 1916; nine rainstorms with total precipitation of 2.26 in. Wherever records showed the influence of rain the corresponding observations were cast out. The rate of discharge in gallons per day from the two sewers was: Mean average (1) 4,343,000 (2) 426,000; Mean Monday (1) 4,388,000 (2) 500,000; Mean Sunday (1) 3,381,000 (2) 368,000; Maximum dry-weather (1) 6,245,000 (2) 1,121,000.

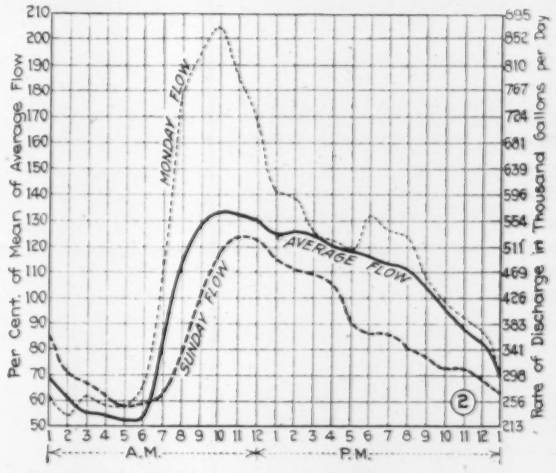
In the fall of 1917 the electors approved a bond issue of $2,800,000 to carry out the plan. Based on the Ten Mile Creek investigations, six miles of sewer with inverted siphons and storm interceptors and a 90,000,000 gal. pumping station have been designed.

The present mean and maximum rates of sewage discharge into Ten Mile Creek were determined under three classes—domestic, industrial and ground water. The first was expressed in gallons per capita per day (g.c.d.) and the second and third as gallons per acre per day (g.a.d.). There are no commercial areas in this district.

In the end of each of the five main sewers, ranging in diameter from 54 to 72 in., a carefully constructed sharp-edged weir was placed. An automatic recording water-level gage was installed in each sewer to record continuously the head on the weir. These gages, although constructed to run a week without attention, were inspected and checked daily. They were maintained long enough at each sewer to give about four weeks of good dry-weather record after allowing for rain and other interruptions.

The sewer-gage records were scaled at each hourly division, giving the rate of discharge of each sewer for each hour of the 24 for every day during the period. These hourly discharges were tabulated by averaging all the discharges corresponding to any given hour for all the days of the record, then for all the Sundays and then also for all the Mondays.

In order to relate the sewer discharge data to population, areas and industries, a census was taken in the districts which are now sewered and drain into Ten Mile Creek. One largely undeveloped area, known as West Toledo, was omitted from the census. Every house, store and factory was visited and the following information obtained: From houses, the number of persons living in each house, the presence or absence of a sewer connection and its location and the presence or absence of bath and toilet in the house.



From stores, the number of persons employed and the amount of water used (meter record).

From factories, the source of water-supply, the quantity consumed, the use made of the water, the location of the sewer connection and the number of employees engaged each hour of the day and night.

Having gathered the field data mentioned it remained to correlate them in such a way as to derive the mean and maximum unit rates of sewage discharge previously mentioned. The method of procedure was to determine separately the average daily discharge of ground water, domestic sewage and industrial wastes.

Ground Water—Going back to the original sewer discharge records, we picked out the single hour giving the

TABLE I. SUMMARY OF SEWER CENSUS DATA, TAKEN IN THE TEN-MILE CREEK DISTRICT, TOLEDO, OHIO

Sewer district	No. 27	No. 26	No. 16	No. 22	West Toledo	Totals and Means*
Outfall sewer	Monroe	Ayres	No. 34	Lagrange	"	
Total area (acres)	280	288	1,083	502	654	2,153
Residential area	225	181	911	501		1,818
Industrial area	29	62	129	1	0	221
Commercial area						
Parks, R.R. yards, etc.	26	45	43			114
Total population	2,634	3,902	17,087	17,838		41,461
Population connected by modern plumbing	1,698	2,880	16,435	5,226		26,239
Population connected by vaults and sinks	191	793	407	11,082		12,473
Population not connected in any way	745	229	245	1,530		2,749
Number of houses	626	937	3,897	3,247		8,707
Average population per house	4 2	4 2	4 4	5 5		4.75
Average population per acre of residential area	11 7	21 6	18 7	35 6		22 8
Average population per acre of total area	8 9	13 5	15 8	35 6		19 3
Per cent. of total area which is vacant	61	32	22	19		28
Total length of sewers, mi.	6 73	5 96	17 82	11 70	10 93	42 21
Total number of persons employed in industries	763	2,131	19,990	99	0	22,983
Water-supply to industries other than city water, g.d.	50,000	140,000	3,012,000	0	0	

*Totals and means exclude West Toledo.

minimum rate of discharge. From this amount we subtracted the industrial wastes known to be flowing at that hour and called the remainder the ground-water discharge. It is interesting to note that the minimum discharge occurred, in every sewer but one, at 3 a.m. Monday. The one exception was at Monroe St., where it occurred at 5 a.m. Monday.

Domestic Sewage—This is primarily the water which is used in residences, flats, etc. It comes from those houses having sewer connections, and is composed almost entirely of the water supplied by the city. Knowing the number of persons living in each house, we went

TABLE II. MEAN DAILY DISCHARGE OF SEWAGE AND ITS CONSTITUENT PARTS, EMPTYING INTO TEN MILE CREEK, TOLEDO, OHIO

Sewer district	No. 27	No. 26	No. 16	No. 22	Totals and Means
Ground water leakage, g.d.	157,000	212,000	1,191,000	123,400	1,683,000
g.a.d.	557	736	1,100	246	783
g.d. per mile of sewer	23,400	35,600	67,000	10,500	40,000
Domestic sewage, g.d.	53,400	73,000	575,000	175,600	876,000
g.c.d. figured on population with modern plumbing	31	25	35	34	33
g.c.d. figured on total population connected in any way	28	20	34	11	23
g.c.d. figured on total population	20	19	34	10	21
Industrial sewage, g.d.	142,400	249,000	2,577,000	127,000	3,095,000
g.a.d.	4,900	4,000	20,000	127,000	14,000
g.a.d. Council St.* omitted	4,900	4,000	10,000	127,000	8,200
Daily Mean Discharge, g.d.	352,000	534,000	4,343,000	426,000	5,655,000
g.c.d. figured on total population connected in any way	186	146	258	26	146
g.c.d. omitting Council St.*	186	146	182	26	113

*Council St. power station discharges a large amount of cooling water taken directly from the creek and discharged into the sewer of District 16. It will be kept out of the intercepting sewer.

Relation of total sewage discharge to City water-supply: Water-supply for 1916 (up to September), 103 g.c.d.; sewage discharge (omitting Council St.), figured on total population, 105 g.c.d.; ratio, sewage discharge of water-supply, 102%.

to the meter records and found the water consumption corresponding and converted it into gallons per capita per day consumed by various classes of residents. These figures applied to the number of persons connected to the various sewers gave the estimated mean rate of discharge of domestic sewage.

Industrial Wastes—The meter record of every manufacturer in the district was tabulated. The quantity of city water sold to the industries was added to the amount of private industrial supplies, as determined by special measurements and investigations, and the sum was used as the average discharge of industrial wastes.

Adjustment—Adding the estimated ground water, domestic sewage and industrial wastes for each district, we get the estimated mean daily discharge of sewage from that district. The weir measurements, previously described, give the actual daily discharge of sewage from each district. The estimated values are now adjusted to agree with the weir measurements. It will be of interest to know how close the estimates of sewage discharge came to actual discharges as measured by the weirs.

Having derived figures representing the daily mean discharge of the various components of the sewage from each of the districts, it still remained to determine the maximum rate at which the sewage is discharged, since the intercepting sewer must be designed to accommodate this maximum rate. In order to arrive at an estimate of this maximum rate, certain assumptions were made, as follows: (1) The discharge of ground water is constant from hour to hour during any one day; (2) the average amount of domestic sewage is the total Sunday discharge minus the ground water; (3) the average amount of industrial sewage is the

TABLE III. ACTUAL DAILY MEAN SEWER DISCHARGE AS COMPARED WITH ESTIMATED SEWER DISCHARGE FOR THE TEN MILE CREEK DISTRICT, TOLEDO, OHIO

Sewer District	Actual Discharge by Weir Measurements	Estimated Discharge from Census Reports	Error of Estimates Expressed as per cent of Actual Discharge
27	352,000	271,400	—23%
26	534,000	698,500	+31%
16	4,343,000	5,332,000	+23%
22	426,000	280,600	—34%
Total	5,655,000	6,582,500	+16%

average flow minus the Sunday flow; (4) the discharge of domestic sewage on Monday is the Monday flow minus the average industrial flow and the ground water.

Each of the above subtractions was performed graphically for each of the 24 hours on the discharge curves of which the illustrations are samples. Thus, mean hourly rates of discharge were derived for average domestic sewage, Monday domestic sewage and industrial wastes for each district. These mean hourly rates for the various components of the sewage were checked against and made to conform to the daily means given in Table II. The maximum hour was picked out for each component part of the sewage and expressed as a per cent. of the mean discharge of that component for the day. Maximum discharges are also expressed as gallons per day. Table IV gives a summary of the foregoing calculations, as well as a comparison with observed maximum rates of discharge at the various sewer outlets.

To sum up, the reader will observe that the general scheme was to estimate present discharges in exactly the same way that we must now estimate future discharges; then to check or correct the present estimates by actually measuring the present discharge, and now to apply the corrected estimates to future conditions.

Using the mean discharges and the maximum rates obtained as already explained the following unit quantities were derived for design: Ground water: Mean rate of discharge, 777 g.a.d.; maximum for any district, 1100 g.a.d.; maximum to be used to cover spring conditions, 1200 g.a.d. Domestic sewage: Mean rate of discharge counting total population, 21 g.c.d.; ratio mean to maximum, 354%; maximum rate of discharge, 75 g.c.d. Assuming that this maximum rate of discharge will increase in proportion to the total water

TABLEIV. ESTIMATED MAXIMUM RATES OF DISCHARGE OF SEWAGE AS COMPARED WITH OBSERVED MAXIMUM RATES OF DISCHARGE INTO TEN MILE CREEK, TOLEDO, OHIO

Sewer district.....	No. 27	No. 26	No. 16	No. 22	West Toledo	Totals and Mean %
Domestic Sewage: Daily max. expressed as % of daily mean	189	200	207	193	200	.....
Daily max. expressed as rate of discharge in g.d.....	91,000	128,000	1,260,000	334,000	160,000	.....
Monday max. expressed as % of daily mean...	261	400	350	332	450	354
Monday max. expressed as rate of discharge in g.d....	127,000	256,000	2,130,000	580,000	360,000	3,453,000
Industrial Wastes: Daily max. expressed as % of daily mean	120	142	136	133	.....	134
Daily max. expressed as rate of discharge in g.d.....	173,000	358,000	3,430,000	170,000	.....	4,131,000
Ground Water: Rate of discharge in g.d	157,000	212,000	1,191,000	123,000	312,000	1,995,000
Totals: Sum of Rates of discharge of Monday max., industrial max. and ground water.....	457,000	826,000	6,751,000	873,000	672,000	10,079,000
Checks: Observed max. rates of discharge as g.d.	680,000	842,000	6,245,000	1,121,000	790,000	9,678,000
Estimated maxima expressed as % of observed maxima..	67	98	108	78	85	104

consumption (a study of water consumption had previously been made but is not included in this article) the maximum rate of discharge of domestic sewage for 1960 will be $(125/103) \times 3.54 \times 21 = 90$ g.c.d., where 125 and 103 are the 1960 and 1916 rates of water consumption for Toledo.

Later, when the sewers were designed, it was felt that, as the districts became very large and the sewer became very long, it was advisable to have a sliding scale of rate of domestic sewage discharge. Reference to Table II will show that the average discharge of domestic sewage, figured on the population connected with modern plumbing, was 33 g.c.d. Assuming again that this will increase at the same rate as the consumption of water, and that by 1960 all houses will be equipped with modern plumbing, the mean rate of discharge of domestic sewage for 1960 will be: $(125/103) \times 33 = 40$ g.c.d. The ratio of maximum to mean rate is expressed by the formula

$$\frac{Max.}{Mean} = 1 + \frac{14}{4 + \sqrt{p}}$$

where $p =$ the population living on the drainage area, in thousands. This gives a maximum rate of discharge of 90 g.c.d. for a population of 50,000 and the least maximum rate used was 67 g.c.d., corresponding to a population of 268,000.

For industrial wastes the mean rate of discharge was 14,000 g.a.d.; ratio maximum to mean rate, 134%; maximum rate of discharge, 18,800 g.a.d.; mean rate of discharge, excluding Council St., 8200 g.a.d.; ratio maximum to mean rate, 134%; maximum rate of discharge, excluding Council St., 11,000 g.a.d.; maximum rate to be used in the design of the intercepting sewer, 14,000 g.a.d.

Summarizing, we have, ground water, 1200 g.a.d.; industrial wastes, 14,000 g.a.d.; domestic sewage

$$\left(1 + \frac{14}{4 + \sqrt{p}}\right) \times 40 = g.c.d.$$

This work has been done in the office of the sanitary engineer, which was created for this investigation. The author was retained as special sanitary engineer by Harry C. McClure, commissioner of engineering and construction of the City of Toledo. The entire organization is part of the Department of Public Service, of which David H. Goodwillie is the director. The engineering firm of Hoad & Decker, of Ann Arbor, Mich., was retained as advisors for the entire work.

Increase Fire Pump Efficiency

IN STARTING the high-pressure pumps of the fire-service station in Toledo experience has enabled the operators to make a saving in electrical energy over the original method proposed, whereby regulator valves bypassed the discharge back to the suctions. C. H. Carroll, chief operator, in his latest annual report, explains the method as follows: The pumps are started with all discharge valves closed. As soon as the pump reaches full speed the main-line discharge valve is slightly opened. The pump then builds up the initial line pressure of 175 lb. The excess beyond this is controlled by the use of a 3-in. bypass valve. This maintains a steady pressure without interfering with the main-line valve except in the instance where a larger volume of water is required, when the main-line discharge valve is opened farther to meet the requirements until the pump capacity is reached at the head maintained, at which time another unit must be thrown in to supply the demand beyond the capacity of the first pump.

This method of operation has the advantage over the original plan of saving considerable electrical energy, as the pumps do not supply any more water than is actually needed, whereas in the original plan the pump discharges at full capacity at all times, the excess of water pumped over that actually used being taken care of by the regulating valve, which allows it to recirculate through the pump by discharging it into the suction pipe. This has produced severe breaks on the suction end of all pumps when in use.

During 1917 a total of 139 alarms were turned in, but the high-pressure service was required but seven times, for a total period of 15½ hours. The maximum rate of pumping was 4400 gal. per minute to supply 13 high-pressure hose lines with 200 lb. pressure for 4½ hours. Once during the year current was shut off from the local power station while running on an alarm received from the power station itself. A second source of supply will be available when the new power plant nearing completion is in service.

Court Holds Hotel Garbage Is Private Property

Hotel and restaurant garbage at Grand Rapids, Mich., has been declared private property, subject to disposal by the proprietors in such manner as they see fit, providing there is no violation of local health ordinances in handling the garbage. The decision was rendered by the Superior Court of the City of Grand Rapids, in a suit brought as noted in *Engineering News-Record* of Oct. 11, 1917, p. 716. Fred H. Locke, city manager, informs this journal that the city will appeal to the State Supreme Court.

Forcing Culverts Under Roads With Hydraulic Jacks

Pipes Up to Four-Foot Diameter of Corrugated Iron or Concrete Installed at Costs Lower Than by Open-Cut Method

IN BUILDING culverts for irrigation ditches under highways and railroads, the South San Joaquin Irrigation District in California found traffic and foundation problems frequent and serious. Providing temporary routes on roads and effecting agreement with the railroad companies could be avoided in large measure, it was thought, if the culverts could be forced into place by hydraulic pressure. This method would not disturb pavement or track foundations as would be the case in making open cuts. The first experiments in jacking the culverts were so successful that the practice was extended and now is generally used for pipe of inside diameters up to 48 in. Thus far there has been used for this purpose cast-iron pipe, corrugated iron pipe in 20-ft. sections, reinforced-concrete pipe in 2-ft. sections, and a monolithic 42-in. pipe 32 ft. long. Diameters ranged from 12 to 48 inches.

The general method of carrying on the work may be best understood by the detailed description of the operations in jacking through a monolithic concrete culvert. This was a 42-in. inside diameter pipe underneath the Southern Pacific Ry. at Lathrop. Its entire 32-ft. length was first cast on a wooden platform built to grade. The barrel is circular inside but has a flat base 54 in. wide and a height of 54 in. The outside of the pipe was made of uniform size, to offer the minimum friction resistance.

After allowing the concrete to set for one month, a 60-ton Watson-Stillman two-speed hydraulic jack was set up against a wall supported bulkhead and the open-ended tube was started through the roadbed. This work consumed three days and was done by a crew of five men. Three men worked constantly inside the tube, handling the earth as fast as it was displaced by the barrel. One man in the heading dug out the earth a few inches ahead of the tube and trimmed the inside of the excavation to a shape slightly smaller than the outside of the tube, and the other men passed the muck back as fast as it came in. No cutting edge was provided on the tube.

Jacking pressures began with 20 tons at the start, which was approximately the weight of the tube, and increased to a maximum of 55 tons at the finish of the job. The advance made on the first day was about 13 ft., on the second day about 7 ft., and on the third day about 10 ft. The jacking pressure varied noticeably with the method of handling the dirt. A slight piling up of material inside the tube would be followed by an increase in pressure-gage reading. To relieve this increased pressure the jacking was stopped from time to time to allow the muckers to catch up with their work. When jacks were applied again after such stoppage the pressure was invariably less than when the work was stopped. During the passing of trains over the track above the pressure was reduced two or three tons, the actual cause apparently being the reduction of friction due to vibration, as a result of which the tube advanced enough to cause the pressure drop noted. In the course of this work the material on neither side of the embankment caved and trains were not even given slow orders when passing over the work so that the plan met with the entire approval of the railroad, it was believed.

The itemized cost of this work was as follows:

Labor (Building):		
Excavation	$49.93	
Placing steel	15.61	
Building forms	103.94	
Pouring concrete	104.67	
Stripping forms	15.67	
Back-filling	52.89	
Pumping	21.11	
Hauling cement, gravel, sand, lumber, plant, etc.	120.57	
Superintendence	40.00	
Auto hire and transportation	37.50	
		561.89
Labor (Jacking Tube Under R.R.):		
Rigging plant	7.04	
Installing	71.45	
Wrecking plant	2.66	
Superintendence	12.50	
Auto hire and transportation	5.60	
		99.25
Material:		
Cement, 321 sacks at 56c. net	200.78	
Gravel, 46.7 cu.yd. at $1.30	60.70	
Steel, 870 lb. at $4.23 per 100 and 2,964 lb. at $4.18 per 100	160.70	
Self-centering	39.57	
Form lumber, 2,100 f.b.m. at $10	21.00	
Form lumber and mill work	9.96	
Nails	1.20	
Pumping supplies	2.00	
Equipment charge	15.00	510.91
Total cost		$1,172.05
Cu.yd. of concrete	46.7	
Total cost per cu.yd		25.10

On this job the soil was fairly tight and had very little tendency to cave. Water was 18 in. deep in the

MONOLITHIC CONCRETE CULVERT BEING PUSHED BY HYDRAULIC JACKS UNDER A HIGHWAY

MEN ARE JACKING THE END OF THE APPARATUS TO FORCE PIPE UNDER A HIGHWAY FILL

excavation and highly charged with alkali. The high percentage of cement used was to insure an impervious concrete not likely to be affected by the alkali. Hauling was done from Manteca (5 miles) and Lathrop (1¼ miles).

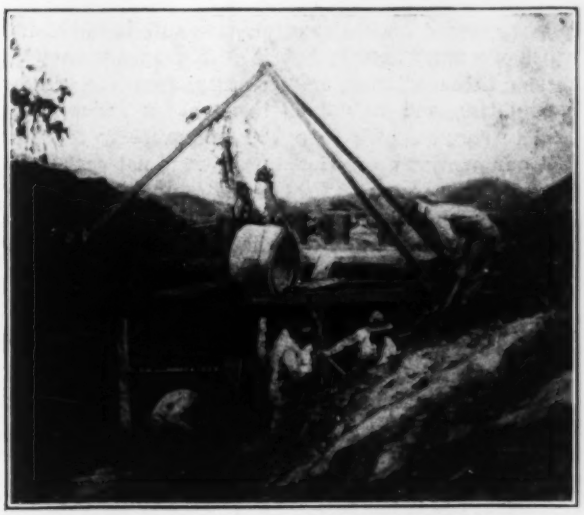
Most of the irrigation ditch crossings were made with 30-in. concrete pipe in short sections. The difficulty in jacking these into place was in keeping line and grade true. In general, if the first pipe was leveled and aligned correctly and all joints tightly fitted, a straight line job resulted. Joints not tightly fitted sometimes crushed locally under the pressure, which occasionally was as great as 40 tons. The greatest difficulty in securing tight joints was caused by quicksand getting into them at the bottom of the pipe. This introduced a vertical curve into the culvert line and caused it to raise at the front end. Work was frequently carried on in 2 ft. of water to prevent too great an inflow of quicksand.

There is some difference in the cost and need for care in jacking corrugated iron and concrete pipe. This is dependent largely upon materials encountered. In quicksand it is believed to be cheaper to install the concrete pipe, because it is then only necessary to open up a pit sufficient to take three 2-ft. joints which can be jacked ahead and additional joints placed as the work advances. With the corrugated pipe, on the other hand, a pit long enough to take the usual 20-ft. length is required. A wide variety of soil conditions was encountered in the course of the several jobs undertaken and the material often varied on a single job. In one case the man removing material at the heading used a hammer and chisel when the work started and dipped it up in buckets before the job was finished.

In using corrugated pipe, corrugations collapsed on two occasions and in one case the work had to be turned into open cut. Sometimes buckling occurred at joints, due to insufficient riveting. This riveting frequently had to be done by men working in a foot or two of water, so that only as many rivets would be put in as were thought necessary to develop the required strength for the jacking. However, 13 culverts have been jacked into place by the district and in only the case referred to was it necessary to abandon the plan and go back to the open cut method.

On one occasion an 18-in. cast-iron pipe with bell and spigot joints was jacked under a railroad. It was found that the bell ends of the pipe shoved a considerable volume of earth ahead of the joints. This loosened the roadbed and required the full capacity of the two 15-ton ball bearing jacks, leading to the decision that where bell and spigot pipe was used it should be jacketed to the smooth section by wood or concrete lagging.

The largest pipe was a 48-in. corrugated iron culvert put in in 22-ft. lengths and which had a total length of 66 ft. This was jacked between 50 and 60 ft. under the paved highway at a depth of about 6 ft. over the top of the pipe. The pressure required did not exceed the capacity of two 30-ton hydraulic jacks, but used their full capacity. It was found that corrugated pipe would shorten considerably under heavy pressures. A shortening of several inches was noted in this 66-ft. length of 48-in. pipe. Concrete pipe was capable of withstanding higher pressures than the corrugated iron pipe. Jacking pressures depended to large extent upon the character of the soil. In hardpan where the hole was trimmed to the exact size of the pipe, pressures did not exceed 20 tons. In fine flowing sand, jacking pressures often



MOST CIRCULAR CONCRETE CULVERTS ARE PUT TOGETHER IN SMALL PIECES WHEN BEING PLACED

ran as high as 40 tons and sometimes more. Eccentric pressures on corrugated pipe were found to throw it into a curve by unequal shortening of the corrugations on opposite sides. The same tendency was noted with concrete pipe in short sections unless the joints were close with no earth or trash between.

When the work described in the foregoing was under way, A. Griffin was chief engineer of the South San Joaquin Irrigation District. Much of the construction was supervised by R. W. Olmsted, who has since succeeded Mr. Griffin as chief engineer.

Architects Must Put Utility Before Aesthetics

C. H. Blackall Tells Profession Members Must Organize Firms Able to Administer Work and Handle Concrete Problems

HOWEVER we may try to account for it, or in whatever manner we may seek explanations or excuses, the fact is unquestioned that in this, the greatest crisis the world has ever seen, architects have not been given a leading part, said C. H. Blackall, writing in the *American Architect* for June 5 last. A profession which calls preëminently for powers of organization, administration and the kind of efficiency which springs from clear conception and an equally clear adherence to the essential facts of the problem, has found almost no part to play, he continued, in the tremendous upheaval of these days except to be incidentally employed in one of the simplest problems offered to the architect, namely, low-priced houses, and then often in competition with builders and real estate speculators. Instead of being judged, and condemned or accepted for our share in the essentials of life, for our real solution of live problems, we seem to have been classed with the merely petty arts which dress life but do not create it. We cannot legally complain of the choice which has been made of agents and methods for carrying out the enormous building problems which the country has undertaken. The fact that architects have had so little to do with them, and that their employment by the Government is so rare as to arouse wonder when so employed at all, is something which we must accept; but it is the wise man who, passing through stress, emerges therefrom into greater possibilities, and who finds through his failures the road to success. We therefore can properly consider that our present professional position is not sent to us for our sins, nor merely for our chastening, but in order that we may be able so to arrange our architectural deportment and possibilities that the future may give us greater promise of growth.

Two Views of What Constitutes an Architect

There are two distinctly varying concepts of an architect. The first is that he is an artist, that his chief interest is in making pictures, either on paper or in actual composition; that business has nothing to do with him except as an incident to his art; that, as architecture is the mother art, therefore the architect is at his best when occupying himself most exclusively with the pure art of his profession. This view does not preclude a recognition of business, construction and other so-called practical factors, but it puts the emphasis on the creative and artistic, relegating everything else to a second place. This is the view which has gradually been gaining since the beginning of the Italian Renaissance, and which has dominated the profession during the past few years, shaping its ethics, controlling its practice, and, in as far as it is one-sided, limiting the effective output of the individual. The other view is expressed by the very word "architect." He is not the "builder of arches" but the "arch technician," or, to use the modern phrase, the master builder. His function is to do and plan things in an orderly sequence and with a consideration for all the factors which enter into a complete structure, of which, very naturally, the artistic appearance may be beyond question an important one, but is not of itself sufficient, and, except in rare cases of monumental design, is really a byproduct rather than a dominant factor. He differs from the engineer in that he is not to be one-sided, not to consider mere efficiency nor mere program, nor mere so-called practical factors, but is to take all of these plus the fundamental principles of order, purpose and fitness; and if they are properly combined then the creative element of pure design will result just as inevitably as it did in the west front of Amiens or the north porch of Chartres.

This second concept was the point of view of the thirteenth century, and if the signs of the times are read aright it is the attitude that the architect will be forced to assume, even against his will at times, and even if under imputation by some of his professional brethren of being unprofessional. The absence of this attitude, or the negation thereof, is sure to bring paralysis to the profession, because the busy public, which pays the bills, has scant use today for anything but action. The war has emphasized this view with sharp and, to many, sickening vividness. It is not enough to be a clever designer, or even the best designer, if best is used in the sense of permitting a disregard of functional building. Rather should we say that absolutely nothing be sacrificed to mere appearance. Artistic appearance, so-called, can, and justly will, be forgotten and be apparent only through its function as an integral part of a real problem solved in a real way. That was precisely the fundamental point of view of the mediæval artists. Their work was always objective; self was always put out of sight, and as we emerge into the opportunities of tomorrow it is our task to make sure of our point of view, and not only make sure of it but incorporate it in our work. The architect may continue to dream dreams and see visions, but if he does he is likely to be out of a job unless those visions are based on sound common sense, on business administration and on constructive development and application.

Contractor, Engineer or Architect?

There will always be building so long as mankind is a gregarious animal. There will also always be a consideration given to the finer artistic qualities which the race incorporates in its monuments and which constitute the true historical record of the age. The question we are interested in as a profession is as to who is to be the directing force in this building work. Will it be the master builders, as they are now known? Will it be the engineers, whose day is shining so full of promise now, or will the choice be from the profession which has striven and aspired, written codes of ethics, and taken position on pedestals, beneficently arrogating prominence in constructive arts, and speaking *ex cathedra* on every occasion, only to find that consideration is no longer an inevitable appanage? It is really a pretty serious question for us. No man is likely to have the whole truth revealed to him, and none of his reasoning from finite experience and limited vision can hope to answer all of the questions; and yet it hardly seems possible that the architect of four years ago will have much consideration four years hence, unless he changes very fundamentally. He must be a new man, regen-

erated by the acid test of trouble, and with a point of view toward real architecture more nearly akin to the mediæval period. It is the writer's conviction that the architect of tomorrow will find his truest inspirations in the mediæval attitude rather than in that of the Renaissance; that whether we admit it or not, whether we like it or not, whether we are chosen or not, the architect of tomorrow must be not first an artist but first an organizer and an administrator. That the older members of the profession will change, is, of course, very much to be doubted; that many mistakes will be made goes without saying; that the unworthy and the unfit will be just as prominent then as they are now is too manifest to need discussion. But that the architecture of after the war will be something real and something earnest, not obscured but thoroughly concrete, and that the architect will then be the one who can lead in just such lines, whether he comes from technical schools, from the engineering ranks, or from the master builders, is something which I firmly believe, and to which all the signs of the times seem to point.

The Architect of Tomorrow

At the risk of repeating, let me say what I think the architect of tomorrow will be.

In the first place, he will be an organization rather than an individual; a directing, discriminating motive force at the center of a combination of forces, and that organization or combination will be just as essentially a business one as the United States Steel Corporation or the Standard Oil Co., and exactly the same principles of economy, material efficiency and careful attention to detail will of necessity manifest themselves. This organization will be prepared not only to carry out work on definite lines, but to pledge itself that they will be carried out right and on time. In other words, it will guarantee results, and not be able to avoid responsibility by sheltering itself behind a cloak of professionalism. I do not believe that it will assume all the functions that we now hand over to the master builder, any more than I believe the master builder will lose materially in his particular line, but it will have a greater degree of direct contact with the mechanics, many times, I believe, a direct hiring of them on behalf of the owner and a general direction of the work which is now very often in the hands of brokers styling themselves master builders. And the fact that this organization is to free itself from mere professionalism and abandon the cloister or studio point of view, will necessarily bring it into the world's markets so that it will have direct contact with the producing factors that enter into a building. It may even direct these producing factors and be a part itself of the producing side; and still further, as all large works have to be financed, I see no reason to doubt that the architect will have a considerable importance as an administrator, and therefore necessarily, to a certain extent, as a financial agent.

Furthermore, this organization will be formed not to win a competition or to impress a susceptible public, but to carry out building. The kind of organization that will win a competition is pure theory, and pure theory is what we must avoid. The organic development of building, if looked at right, is pure architecture, and that is just what the world wants. It is to be hoped that the future may see a larger abolition of that unfortunate method of bringing ourselves before the public which we call competition. The true competition always is in the finished product, but the idea that by a series of drawings an architect can win recognition is, I believe, at the basis of a good deal of our present limitation as a profession; and the more resolutely we in the future refuse to consider architecture as in any sense drawing, as in any sense picture making, the more surely will we emerge into the larger view which the coming years are to demand and to which we have been so blind in the past. There are many who have had their eyes opened to the extent to which we have not as a profession properly viewed our limitations, and we will have further disagreeable experiences, I am afraid, before the true architectural point of view is brought home to us. We are still passing through the mill, and compensation for our present woes ought to be, in part at least, in the feeling that out of defeat can and will grow a better equipment for victory.

Utility First, Art Incidental

Does this imply architecture will be any less a fine art than it is today? Not a bit of it. The trouble with so much of our pre-war architecture was not that it was too artistic, but it was not artistic in the right sense, in that it was not fit and appropriate for its purpose. Ruskin's emotional stone carver who, just for the love of carving, would cut a wondrous bit of detail way up in an obscure loft, where no one would ever see it, could keep on doing just that sort of thing sometimes, but he would not be in the architectural spirit. The place for that kind of work is in a museum and not in a real building. Architects are to build real buildings, and the man who would waste that kind of sentiment would be out of place in the very practical, very tense and very demanding world of after the war. The best art always has been the art which was the most real in its application. Architecture would still be the mother art, but the architect, while admitting the preëminence of the artistic thought, would, I should hope, recognize also that art is not preeminent or maternal which is simply blossoming for itself without a distinct purpose, and the architect who thinks for a moment that the contemplative, æsthetic point of view, delightful as it is, necessary in a certain degree as it has been found to be, will suffice for after-war conditions, is bound to receive a harder jolt and a more bitter disappointment than in these parlous days of 1918. To paraphrase the poet, architecture is real, architecture is earnest, and mere unrelated beauty is not its goal. A dream of pure art, a dream of beauty cannot be spoken of the real soul of a building.

Nor does the foregoing imply the elimination of the individual. There have been some wonderfully endowed men like Wren, Mansard or Bulfinch, who seemed to be able to compass all sides of our profession and to properly subordinate the relative factors; but, after all, most of us work best in harness and with limitations, and the very fact that an organization implies subordination of one part to the other is a salutary restraint on the development of the unessential. Again, a man might be just as strong and true alone by himself as he would be as an individual doing similar things at the head of an organization, but somehow I cannot help feeling that

the individual architect will be much more of a rarity in the future than he has been in the past, and that in organization, in coöperation and specializing within the limits of a firm the architects will find their best opportunities.

After the war this country will undoubtedly pass through a period of enormous building activity. We have slowed up on all our lines; we are behind in every kind of structure having to do with the arts of peace; our investments in real estate have had a great setback, and for certainly three or four years after the war there will be a lot of big prizes to be passed out to some one. Who will get these prizes? Will it be those who want them most or those who can do them best? The answer is so obvious that it hardly needs argument. The great mass of our people do not know and do not care whether a building is artistic or not, especially as far as relates to the selection of an architect, but the great mass of our people, on the other hand, are pretty good judges of what they like, and unless we are prepared as a profession to give them a square deal, a business administration and a workable solution of the so-called practical requirements, and unless, furthermore, we can do all that, and, besides, clothe our expression in real art—and by real art I mean art that is fitting and proper, neither overlaid, considered apart, nor obtruded—we simply will not get the work, and the sooner we admit it and shape our plans accordingly the more likely we are to be of real service to the community for the next ten years.

Public the Final Judge

I believe the profession will justify itself to the world, and justify itself in a way to bring absolute conviction to the public, whose attention has really never been caught by mere pretty work. The thought and study, the intense preparation, the carefully considered educational scheme which has been so thoroughly developed in the past, cannot fail to count in the long run for the very best side of real, practical, common-sense architecture. It is, of course, much easier to make these general statements than it is to say just how the results will be manifested. I sometimes wonder if a good deal of our troubles in the past and in to-day have not arisen from the fact that we have allowed the general public to believe that a diploma of architecture, or sometimes even a sign on a door, is an indication of ability, and whether we have not been a little ready to assume that an architect can be such by mere willing to be; that the will to win will create a good architect, according to our imaginations, just as some military critics think the will to win insures the winning of the war; and it is quite possible that certain portions of the public have accepted us at our face value and assumed, because we called ourselves architects, that therefore we be such. I sincerely hope the war and our present experience may brush this idea absolutely aside. Temperament, natural endowment and birthright certainly count for as much in the practical business side of architecture as they do in the dream life of the imaginative designer, and the number of those who are really able to handle the architectural problems is, after all, surprisingly small. The public will appreciate this better after the war, and the architect who has the gift not to make pictures but to make architecture will undoubtedly have ample opportunity, and with a clearer field and a more sure appreciation if he can deliver the goods; but may the profession be delivered for generations to come from the attitude that the architect can create himself, that a four years' course in a school can make amends for a wrong temperament, or that even the fathering of a lot of poorly designed buildings gives a man the right to call himself an architect.

The architectural profession will profit by the experiences of the war, Mr. Blackall concluded. A future opens up for it bigger than anything we dreamed of before, because our buildings will be real buildings instead of fancies, our business will be real business instead of that of dilettanti, and there is enough real common sense in the profession to enable even some of the older ones to grow into administrative ability; while as for the young men who will be coming home from the wars, eager and ready to take their share, and fresh from the influences of the delightful atmosphere in France, they surely will be doing real things, just as they are doing real things now, and the biggest thing on earth will then be, as we have fondly assumed it had been in the past, a great work of architecture.

Society Service

A Section Dealing with the Results of Teamwork by Technical Men

The "Local Section" Problem

HOW can the national societies best serve their members back home? No one has yet found a satisfactory answer. However, notes prepared recently by Prof. F. H. Newell of the University of Illinois state the problem which is crying for solution and agitating leaders in local organizations perhaps more than any other single issue. Usually these men are the "live wires" in their communities and are also members of some one of the national societies. Lack of harmony between the two types of organization and duplication of effort is unfortunately engendering a feeling of disgust at the "do-nothing-concrete" attitude toward coordination which results in non-support of any organization. It is easy to say "there are too many organizations," and then work in none.

Professor Newell's notes follow: "The local section problem is the stumbling block of all movements because the local sections, while good in themselves, prevent the larger and better development in the same way that a small well-built house on the corner of prominent streets may prevent the erection of a really commodious business block. They are effective for the purpose intended, but are an obstacle to the realization of larger ideals, so that on the whole it is a question as to whether in the long run they had not done infinitely more harm than good to the profession as a whole.

"It is generally conceded that in every city outside, say, of New York and possibly Chicago and St. Louis, there should be one inclusive engineering organization, bringing together all of the men who properly call

themselves engineers and giving attention not only to technical matters, but to local affairs of concern to its members. The growth of these local societies has been retarded and often prevented by the existence of a fairly good local section under the control of the New York body.

"It is probable that somewhat radical steps must be taken and the suggestion has been made, as given in *Engineering News-Record* of Jan. 17, p. 142, that membership in a local society should be prerequisite to that in one of the national societies. It is possible that by working upon this principle the evils can be overcome.

"A national society should not encourage the formation of a local section in any city where there is already existing an inclusive engineering society, but should use every effort in its power to stimulate the local society and have affiliation with it, possibly through a section of that society. For example, the American Society of Mechanical Engineers should endeavor to stimulate the growth of a mechanical section in the Cleveland Engineering Society and refuse to recognize a body of mechanicals distinct from that forming a part of the Cleveland society or at least until some good reason was shown to the contrary."

One great difficulty seems to be the difference in the work it is possible to do. The national societies are primarily and necessarily concerned with technical matters, while the local societies see social, civic and welfare problems which can only be attacked effectively by unified action of engineers of all kinds. No mean wreath of honor awaits the broad minded, sympathetic, patient engineer who can lead his fellows out of the present chaos of society multiplicity.

W. W. De Berard.

Engineers' Club Develops Junior Section

Interest of the young men in society affairs is increased in the Engineers' Club of Philadelphia by the activity of the committee on papers, which recently arranged five meetings especially for younger members. In fact, the attendance was limited to juniors and their guests. The specific object was the enlistment of the interest of young men in the preparation, preservation and discussion of papers. It was felt that the experience gained by the juniors in conducting their own meetings would develop loyalty to the club and qualify them for committee appointments and office when they became senior members.

Last year a prize of $50 was offered for the best paper prepared by a junior. The rules prescribed that the subject matter should deal with engineering work with which the writer was directly connected, or should record investigations, contributing to engineering knowledge, some essential part of which was made by the writer, and that the paper should contain a rational digest of results. Any mathematical treatment must show immediate adaptability to professional practice.

So interested were the juniors that they have now become practically self-sustaining. They decided to continue the meetings during the present year, and perfected an organization by electing their own officers and appointing their own committees. Last fall the juniors instituted a campaign to increase their membership and about 50 applications were accepted.

The board of directors ruled recently that a representative of the juniors should be invited to attend board meetings while matters which concerned them were under discussion. The suggestions were offered to the juniors that they develop their organization to conform as closely as conditions warranted to the club organization, and that the chairmen of their several committees consult directly with the chairmen of the corresponding club committees, so that the young men could get valuable advice and suggestions.

To promote closer relations with affiliated societies as many joint meetings as possible were arranged for by club committees. Programs for these meetings are a matter of conference between the affiliated society and the club. It was decided that papers read at such meetings should deal with various phases of the war, although an occasional paper should be arranged primarily for entertainment. When the subject is treated in a popular-scientific form the meeting is held in Witherspoon Hall; strictly technical papers are presented at the club, and special meetings are held elsewhere, as at the University of Pennsylvania and the Drexel Institute, but only speakers of prominence, accustomed to public speaking, are invited.

Following the amalgamation of the quarterly *Proceedings* with the semi-monthly bulletin, to make a monthly, the club found that its scheduled nine meetings did not provide sufficient papers to fill the monthly. In consequence, several special meetings were arranged for, and in addition affiliated societies were asked to contribute papers presented before their meetings. The proposition met with favor, and the name of the club publication was therefore changed to *Journal of the Engineers' Club and Affiliated Societies.*

Publicity, it has been found, can be obtained in the daily papers when the subject deals with national or local affairs of general interest to the public.

Letters to the Editor

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Does Concrete's Imperfect Elasticity Impair Eccentric Loading Tests?

Sir: In the article by John C. Prior on "Eccentric Loading Tests Result Contrary to Theory," in *Engineering News-Record*, April 25, p. 803, there appears to be a fundamental misconception concerning the theory of stresses. The writer of the article attempts to show a disagreement between theory and test results, when in fact there is no justification for attempting either to corroborate or disprove the theoretical formula for eccentrically loaded prisms by comparison of breaking loads with loads computed from the formula. This may not deprive the tests entirely of their interest or value, but in the cause of accuracy and clearness such fundamental errors should be pointed out.

The principal error consists in the apparent assumption that a formula which expresses the correct relation between unit stress and applied load only when the unit

stress does not exceed the elastic limit may still be used to express the relation between those quantities when the load is sufficient to cause rupture. It is generally understood that the formula for combined flexure and direct stress,

$$f_c = \frac{P}{A} \pm \frac{Mv}{I}$$

does not hold for values of f_c beyond the elastic limit. Consequently there is no theoretical crushing load P which can be computed by the use of this formula, and accordingly no theoretical ratio P/P' such as is indicated in the graph accompanying Mr. Prior's discussion.

Even if it should be desired to make a comparison between crushing load and loads computed from the above formula as if that formula held for conditions beyond the elastic limit, somewhat as breaking loads for beams are computed by the use of the flexure formula, $f = Mv/I$, it is at least questionable whether the formula used by Mr. Prior should be employed for ratios of L/L' such that the center of the applied load is outside the middle third of the base. The formula

$$f_c = \frac{P}{A} \pm \frac{Mv}{I}$$

is true only in case the material or structure is capable of taking tension when the center of the load is outside the middle third, and while this condition can be met in the body of the concrete block it does not obtain at the top and bottom surfaces, where it is probable that the maximum compressive stress occurs. This point, however, is relatively unimportant, for the fundamental fallacy consists in overlooking the fact that there is no such thing as rupture test results being found contrary to theory, when the theory is not applicable to rupture conditions.

The true conditions of stress under eccentric loading can be studied by deformation measurements caused by applied loads, and from such measurements it is possible to make a comparison between theory and test results. Mr. Prior's experiments, therefore, while they do not show disagreement between theory and test results as they are represented as doing, nevertheless are interesting and valuable, inasmuch as they suggest a field for tests which does not seem to have been experimentally investigated and which should be fruitful of valuable results.

J. J. RICHEY.

College Station, Tex.

[This letter was submitted to Mr. Prior, who has made the following reply.—EDITOR.]

Sir—I have read Mr. Richey's letter submitted to me by you, with interest, and I wish to thank him for the criticism.

The "fundamental misconception concerning the theory of stresses" which he accuses the writer of laboring under, consists of attempting to apply the formulas for elastic materials beyond the elastic limit. This might be a serious charge except for the fact that concrete has no elastic limit other than a purely arbitrary one. The stress-strain curves for concrete in comparison as given in standard textbooks have no point of sharp curvature as for ductile materials but are curved from the beginning, the curvature gradually increasing toward the point of failure. The graphs for the experiments under discussion which best represented the deformation readings were in some instances straight lines from beginning to failure, in others a line of uniform curvature, and yet others showed the characteristic gradual increase in curvature. All of this only indicates that concrete is imperfectly elastic, which fact inspired the making of the tests in the first place.

Since the typical stress-strain curves are lines of gradual curvature, common sense would indicate that no arbitrary point on the curves could be picked out below which for equal loads the eccentrically loaded blocks would be subjected to greater unit stress than the concentrically loaded one, and above which the reverse of this condition would prevail.

The actual deformation readings also refute any such theory. Therefore, the writer believes that failure loads do give an indication of the merits of the combined flexure and direct stress formula as applied to "a material as imperfectly elastic and heterogeneous as plain concrete."

Furthermore, he is of the opinion that, if future tests corroborate the results of those described an empirical rule, such as the one suggested in the article, will give results nearer the truth than the formulas for elastic materials.

There was a typographical error in the original paper. Both the P and the L in the formula on line 14, p. 804, *Engineering News-Record*, Apr. 25, should have carried prime marks.

JOHN C. PRIOR.

Washington, D. C.

Rail Joints of the Bridge Type

Sir—In regard to the article on rail joints in *Engineering News-Record* of May 9, p. 926, I wish to point out that in order to carry to a logical conclusion the intention that the angle bars shall support the abutting rail ends, bridging should be accomplished through the angle bars, to avoid multiplicity of supports, if for no other reason. By extending the toes of the angle bars below the base of the rail, a base plate may then seat the angle bars, which in turn will support the heads of the abutting rail ends.

This method of support permits the use of angle bars with short upper bearing surfaces, the bridge analogy then being represented by two connecting deck spans with their ends cut away diagonally; the head of the rail is more than adequate for the service. Such construction concentrates support at the nearest practicable supporting points to the seat of trouble, the wheel-carrying surface.

W. M. PEGRAM.

Brooklyn, N. Y.

What Is Proper Thickness of Foundation Under Brick Pavement?

Sir—Again referring to your editorial in the Apr. 11 issue, entitled "What Most Highway Departments Will Face in the Near Future" and your comments on my letter quoted on p. 1057 of the issue of May 30, I wish to say that when I wrote you I was familiar with the unsatisfactory conditions which exist on the road between Cleveland and Akron. Your statement would lead

the uninformed to believe that all of this 40-mile stretch of road is of brick on a 4-in. concrete base. A large part of the road is of brick on macadam and bituminous macadam on concrete. It is true that the section of brick on a 4-in. concrete base has failed, and failed badly.

This leads us to the question whether in the construction of this part of the road proper precaution was taken to secure good concrete, and also whether a 4-in. foundation under brick pavement is sufficient to withstand the heavy motor-truck traffic which is now using this road and which may be expected on our main trunk highways in the very near future.

Being made up of individual units, the surface of a brick pavement causes continual vibrations. It is impossible to build brick pavements sufficiently true so that there will not be an almost continuous pounding as heavy vehicles pass over it. The distance that the wheel drops from one brick to the other is, of course, small, but when we stop to consider the heavy loads which motor-truck wheels are carrying today and the fact that many trailers are in use, which have steel-shod wheels, it seems reasonable to expect that there is a considerable strain on both the brick and the foundation.

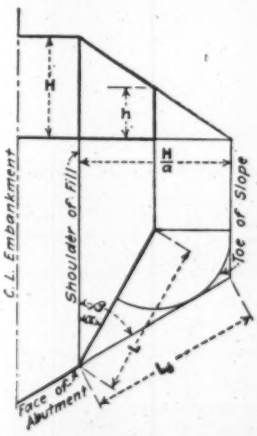
This necessitates the use of a well built heavy foundation, and the truer to surface a road is built the less will be the effect of heavy loads on it.

In my opinion, the road of the future will have to be built without any appreciable irregularities in surface, in order to stand up under the heavy motor-truck traffic which we all foresee.

W. M. KINNEY,
Engineer, Promotion Bureau, Universal Portland Cement Company.
Chicago, Ill.

Shortest Wing Wall Is Not Always Most Economical

Sir—In his interesting letter published in *Engineering News-Record*, of Apr. 18, p. 785, E. F. Kelley, commenting on C. K. Mohler's article of a previous date on abutment wing walls, seems to have lost sight of the fact that it is the wall of the least volume, rather than of the shortest length, that will be the most economical.



Taking the case of the ordinary wing wall, and referring to his Fig. 1 reproduced here, the best angle will be the one which gives a minimum for $V = \frac{H+h}{2} \times LB$, where B is the thickness of the wall, which theoretically can be assumed as unity and to be the same for all walls with the same average depth of back fill.

Owing to limited space, I will not attempt to give here a full analysis of the question, but will only try to prove that the wing wall bisecting the angle between the shoulder of fill and the face of abutment produced, which, according to Mr. Kelley, is the most economical, will not always be smaller in volume than the straight wing wall.

It is easy to prove that

$$h = \frac{H}{2}, \quad L = \frac{H}{2a \sin \alpha}$$

and

$$V = \frac{3H^2}{8a \sin \alpha}$$

For the straight wing wall we have:

$$L_0 = \frac{H}{a \sin \beta}$$

and

$$V_0 = \frac{H^2}{2a \sin \beta}$$

The ratio of the two volumes will therefore be,

$$\frac{V}{V_0} = \frac{3 \sin \beta}{4 \sin \alpha}$$

and as $\beta = 2\alpha$,

$$\frac{V}{V_0} = \frac{3}{2} \cos \alpha$$

It follows then that V will be smaller than V_0 only when $\cos \alpha < \frac{2}{3}$ or $\alpha > 48° 12'$. In other words, $\beta > 96° 26'$ and must be an obtuse angle.

I understand C. K. Mohler in his article claims an advantage for turning backward the wing wall for the slack end only.

M. J. SHAMRAY.
New York City.

Object of Water Studies That Will Be Made at Milwaukee

Light on economical design to meet Milwaukee conditions, rather than an attempt to discover any new principles of water purification, is the main object of the experimental water treatment plant which, it is expected, will soon be put under contract. The small amount of sediment in Lake Michigan water at Milwaukee, compared with the high turbidity which has to be removed by most of the large plants in the Middle West and South, suggests the possibility of economical design in the mixing, coagulating and settling units of the plant.

If these studies at Milwaukee should develop any new or shorter methods of purification than those now well established, they will receive due consideration. It is also hoped that much may be learned by studies of disinfection of the water with chlorine, ozone and ultra-violet light.

As has been previously announced in these columns, the studies at Milwaukee will be conducted by J. W. Ellms, who is now dividing his time between superintending the operation of the Cleveland and Toledo filtration plants and preparing for and directing the Milwaukee experiments.

For several years past experiments on sewage treatment have been conducted at Milwaukee.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Reinforced Handles for Rivet Cutters Save Time and Expense

By H. A. Barends
Rumford, Me.

REINFORCING the handles of rivet cutters by putting a steel strap in the handle saved six handles per day, the loss of iron worth $1.75, and saved the time necessary to make five or six trips to the blacksmith shop for repairs. On the average ten cutter heads were lost overboard every day before a handle could be devised that would stand it up under the heavy blows of the sledge.

Ironwood, oak and ash handles were all tried in turn but were not suitable. Hickory was not obtainable. Finally the handles were slotted with a saw for one-half the length to take a thin strip of band iron.

The iron reinforcing was riveted through the handle with two iron rivets and enough of the iron allowed to extend from the end to permit bending around the head to prevent it from flying off when the handle broke.

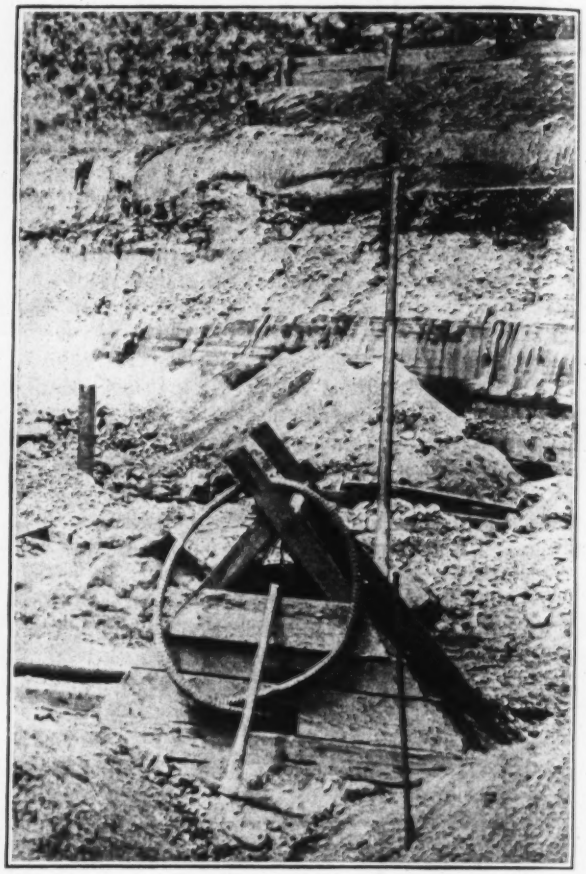
Where the men broke handles and lost iron at the rate mentioned above with ordinary wooden handles, one of the reinforced handles lasts all day and the irons are rarely missing.

Hydraulic Device Handles Sand Cheaply at South American Mine

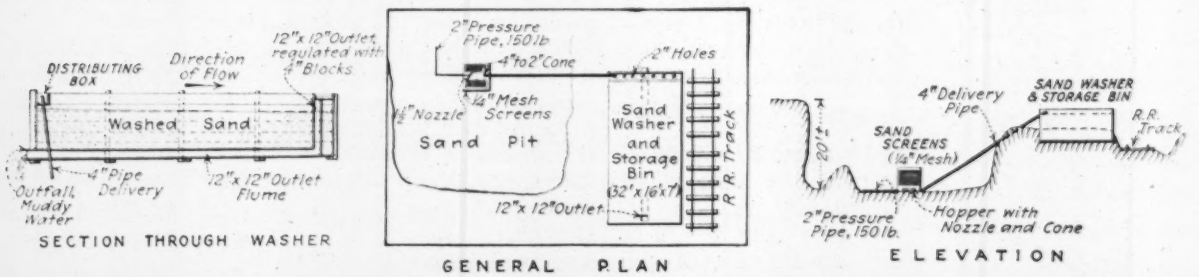
By B. G. Torpen
Oroya, Peru, S. A.

SAND is mined, screened, elevated, washed and loaded on railroad cars for 7½c. per ton by the plant shown in the accompanying layout and photograph. The plant, situated at a mine in South America, is used for handling sand for construction purposes.

The sand is mined by hand labor and shoveled through the A-shaped screens shown in the photograph. Passing through the screens the sand falls into a hopper from which it is elevated by water pressure to the sand washing and storage bin at the railroad track. Water is obtained by tapping a power house penstock which is under considerable head. The water enters the base of the hopper under pressure of 150 lb. from a 2-in. pipe through a 1½-in. nozzle, and discharges through a cone on the other side into a 4-in. conveyor pipe which runs to the washing bin. On its arrival at the bin the sand is distributed over the surface through a long box having a number of holes, the muddy water passing out at the other end of the bin. When sufficient clear sand has collected it is shoveled into cars on the siding. By this method four men, each paid the equivalent of about 75c., American money, per day, can handle 40 cu.yd. per day from the mine to the cars.



CONVEYOR DELIVERS SAND THROUGH FOUR-INCH PIPE



SAND SCREENED AND DELIVERED THROUGH WASHED STORAGE BINS TO CARS AT 7½ CENTS A TON

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Philadelphia Garbage Service Will Cost Less

Collection and disposal of garbage and dead animals at Philadelphia will cost the city $89,256 less next year than this, under a contract recently awarded to Edward T. Murphy, subject to appropriation by the city council when the 1919 budget comes up. It is understood that Mr. Murphy represents the American Agricultural Chemical Co., with offices in the Drexel Building, Philadelphia. His bid was $486,000.

Except in 1913, the contract, which is let yearly, has been held by the Penn Reduction Co. ever since 1906. In 1910 and 1911 this company received $510,000 a year. In 1912, the Blankenburg administration got the price down to $278,000. In 1913 the American Product Co. secured the contract by an underbid of $229,000, but before the year was over the Penn Co. was doing the work.

In 1914 and 1915, midyear bids were asked by the Blankenburg administration, but the Penn Co. refused to bid at that time of the year, and obtained the contract later on. This year bids were asked very early. The Penn Co. again refused to bid, alleging uncertainty as to prices so far in advance. Mr. Murphy came forward with an offer to do the work for $486,000, compared with $576,256 being paid this year. It is expected that treatment of the garbage and dead animals by the reduction process will continue, as for the past two decades or more. Robert C. Hicks is chief of the bureau of street cleaning and George E. Datesman is director of public works of Philadelphia.

Chicago Sanitary District Lets Sliding Scale Contract

A contract for the construction of the proposed Calumet sewage pumping station of the Sanitary District of Chicago, with its equipment, has been let on a basis which takes cognizance of probable future fluctuation, down as well as up, of labor and material costs and freight rates. The successful bidder's estimated costs, based on existing conditions, was $724,000, but to cover anticipated contingencies his bid was made at $905,278. In conference with the trustees of the district the following agreement was entered into: The district proposes to pay half of the cost of the work in excess of $724,000, but not to exceed the amount of the original bid. Should the cost be less than $724,000 the district is to share equally with the contractor in any saving made under this figure. The T. J. Forschner Contracting Co., Chicago, has the contract.

Government Will Control Supply of Labor

Recruiting of Unskilled Workers Supplanted by Federal Employment Agency—Skilled Labor Will Follow

(Washington Correspondence)

The first gun has been fired in the Government's campaign for control of the labor market. To prevent indiscriminate recruiting by individual employers and consequent unsettling of labor conditions in all branches of industry, the United States Employment Service is to be elaborated so that it will be able to take entire charge of the supplying of labor in this country. At first the supervision will be only over unskilled labor in war industries, but it is intended to extend the control into some nonessential industries, and there is every indication that it will eventually take in the skilled classes of labor. Inauguration of such a tremendous program must take time, and the first step is now about to be made.

Necessity for Central Control

Under date of June 17 President Wilson issued a statement which called attention to the necessity for the regulation of labor in war industries and the obvious necessity for some central agency of control, and concluded as follows: "I solemnly urge all employers engaged in war work to refrain after Aug. 1, 1918, from recruiting unskilled labor in any manner except through the central agency, the United States Employment Service of the Department of Labor. I urge labor to respond as loyally as heretofore to any calls issued by this agency for voluntary enlistment in special industries, and I ask them both alike to remember that no sacrifice will have been in vain if we are able to prove beyond all question that the highest and best form of efficiency is the spontaneous coöperation of a free people."

Under the velvet glove of the President's plea is concealed the iron hand of the Government's intention. After Aug. 1 no employer with war business who has a force of more than 100 workers will be permitted to recruit common labor, and all such employers will be required to use the United States Employment Service. This service, which has been in operation for some time offering voluntary aid to the various war industries, will become a much larger institution and its employment will become obligatory upon certain classes of industries. All over the country the representatives of the Government engaged in labor recruiting will be increased until a very large reserve of available men has been built up. Employers requiring men will address their demands to the service, which will fill them according to the needs of the country in the prosecution of the war. In other words, the employment service will form a sort of priority board for the supply of labor. No longer will intensive advertising for or recruiting of labor be permitted. Advances in wages, added attractions in the way of living conditions or working conditions will not be permitted. If possible the present excessive labor turnover will be stopped.

It may be asked by what authority the Government will exercise such control. It will be through the War Labor Policies Board of the Department of Labor, which originated the present scheme. That board is composed of various members of the Department of Labor, and the production chiefs of the War, Navy and Agricultural departments, the Shipping and War Industries Boards and the fuel, food and railroad administrations. The chairman is Felix Frankfurter. Through its control over raw materials this board or its members individually have a potent lever for use against any employer who may selfishly persist in disregarding these rules. The shutting off of the supply of coal, of sulphuric acid, of sugar, of many of the necessary elements entering into manufacture should soon persuade anyone of the futility of going contrary to the department's idea of how labor should be obtained.

To Regulate Skilled and Unskilled

While the ruling applies at present to war workers, it can be readily seen that if nonwar industries persist in combing the labor field and obtain men needed in the essential industries, the strong hand of the department will soon fall upon them. And while the regulation at present applies only to unskilled workers the board has under consideration a ruling to regulate the supply of skilled workers so as to check the widespread advertising that has wrought such havoc in the labor market. This program, however, involves delicate negotiations with the representatives of labor and the employers.

A further and very necessary step in the control of the labor market is the standardization of wages. At present an increased wage scale has been an irresistible lure to the roving workman. This must be stopped. The

board has under consideration the zoning of the United States according to living conditions and the establishment of a standard unskilled labor wage for each zone. As an additional step it will have to take up of course the housing of labor and the conditions of work.

More than four hundred offices are already in operation by the United States Employment Service. Including the machinery of the Public Service Reserve there are some 1700 agencies throughout the country, and this number is to be increased to 25,000. Already the reorganized service is finding and replacing men at the rate of about 2,000,000 a year. Between now and Aug. 1 the United States Employment Service will devote itself to perfecting, recruiting and placing machinery in every state and county and all war industries will be asked to give to the service estimates of their coming needs, so that a national view of common labor requirements may be taken. With this total as a basis each State will receive a quota of common labor which may be drawn upon as men are needed. The State quota will be determined by the main office of the Employment Service and will be based as accurately as possible on each State's resources.

FAIR DIVISION AMONG STATES

The State directors and the Public Service Reserve in turn will divide their States, giving each division a certain portion of its State's quota. Each State director in redistributing his State's quota will consult with the reserve directors of other States, the directors of the Employment Service proper and with business men. It is stated that the quotas are not drafts upon the States but as a matter of fact constitute their protection. Some have been drawn on too heavily, while others have not received their fair shares. By determination of state quotas, it is expected that the fairest possible figures will be obtained. Industries within the States will be cared for by withdrawals from nonessentials within its borders whenever possible.

More Managers Chosen For Northwest Trunk Lines

H. E. Byram, recently president of the Chicago, Milwaukee & St. Paul Ry.; C. G. Burnham, vice-president of the Chicago, Burlington & Quincy R.R.; J. M. Hannaford, president of the Northern Pacific Ry.; W. P. Kenney, vice-president of the Great Northern Ry.; A. W. Trenholm, vice-president of the Chicago, St. Paul, Minneapolis & Omaha Ry.; G. R. Huntington, general manager of the Minneapolis, St. Paul & Sault Ste. Marie Ry., and W. W. Walker, vice-president and general manager of the Duluth, South Shore & Atlantic Ry., have been appointed Federal managers of their respective roads. S. G. Strickland, formerly general manager of the Chicago & North Western Ry., is Federal manager of that system.

Federal Highway Council Controls Road Work

New Committee Formed to Coördinate Functions of All Agencies Relating to Highways

All functions of Government agencies relating to streets and highways will hereafter be coördinated in a body called the United States Highways Council, formed primarily to prevent delays, financial loss and uncertainty incident to the method of taking up each highway problem in its turn with a separate and distinct Government agency. This council was constituted at the suggestion of the Secretary of Agriculture, and is composed of one representative each from the War Department, the Department of Agriculture, the United States railroad administration, the War Industries Board, and the fuel administration. Through the Department of Agriculture, it will continue the close contact already established, both formally by law and informally by practice, with the highway commission in each State.

The council utilizes the organizations of the 48 State highway departments with their trained personnel and their knowledge of local conditions, and provides a single agency in the nature of a clearing house, where all highway projects calling for Governmental action of any character, whether it be a question of finance, of materials, of transportation, or of war necessity or desirability, may be dealt with. It has provided a definite form on which applications for relief are to be made through the respective State highway departments, and has sent supplies of the forms to the departments. It emphasizes the great need of conservation of money, transportation, labor and materials by the restricting of highway and street work to the most essential needs.

Maintenance of existing streets and highways is ranked first, reconstruction of badly damaged streets and highways next, and it places last new construction justified only on account of vital war or economic necessity.

The membership of the board is as follows: War Department, Lieut. Col. W. D. Uhler; fuel administration, C. G. Sheffield; War Industries Board, Richard L. Humphrey; railroad administration, G. W. Kirtley; Department of Agriculture, L. W. Page. These representatives have selected Logan Waller Page, director of the office of public roads, Department of Agriculture, as chairman, and J. E. Pennybacker, chief of management of that office, as secretary.

Government Employment Service Extended to Engineers

The United States Employment Service of the Department of Labor is soon to establish in Chicago an employment agency for engineers. For some time a division of education has been operating as a part of the Federal service in that district, and the present extension of the service follows upon the successful operation of the educational branch. The United States Employment Service is devoted mostly to the finding of unskilled laborers, and in that respect it is to be greatly enlarged, as is noted in the news item on the preceding page of this issue. Its Chicago office, however, which is under the direction of Mr. P. L. Prentice as district superintendent, has been broadening out.

The operation of the engineering branch will be in charge of A. H. Krom, who for the past eighteen months has been secretary of the American Association of Engineers. Full details of the workings of the scheme are not yet available. A meeting is to be held during the present week to work out the methods of operation and an announcement will soon be made as to the extent of the service that the territory covers and the method of registration.

Modification of Drainage Ruling Sought

Drainage activities requiring bond issues will be completely stopped, according to an interpretation put upon a ruling of the Capital Issues Committee by E. V. Willard, acting state drainage engineer, St. Paul, Minn. In a letter to the Capital Issues Committee, dated June 5, Mr. Willard quotes a ruling of the committee which states that after conference with the Secretary of Agriculture and in harmony with his views it was decided "that no project for irrigation or drainage will be favored under present circumstances because there was already sufficient arable land available for present use without resorting to further development in irrigation or drainage at this time." Mr. Willard urges that a stop may well be put to the drainage of (1) land which in the main is wild and unimproved and will require additional farmers and workers; (2) land on which no farmers actually reside at present, and (3) land on which timber is growing and which will not become available for actual farming within the probable duration of the war. He urges that the ruling be "modified so as to allow and encourage the construction of drainage improvements which have for their main purpose the reclamation of waste areas within the boundaries of farms now being tilled." In a general way, Mr. Willard states, this would "apply to all the more densely populated areas of Minnesota. He requests that the ruling be so modified as to permit local committees to examine into each application for financing drainage projects, the findings of the local committees to be referred to the central committee for approval. It seems inconsistent to Mr. Willard that the Federal Government should be urging an increase of food production by every possible means on the one hand and on the other denying the authorization of immediate funds for that very purpose in connection with land drainage.

Engineering Council Creates Special Committees

Will Study Licensing of Engineers and Coöperate With Other Bodies In Furtherance of Americanization

The Engineering Council decided, at the meeting held June 20, to create a small special committee of selected membership to make a thorough study of the question of licensing engineers, and authorized the formation of a committee on Americanization activities for the purpose of coöperating with the National Americanization Committee and the bureau of education of the Department of the Interior, as had been requested by a member of the bureau. The council also forwarded a resolution to Governor McCall of Massachusetts, urging the appointment of at least one engineer to the proposed Public Utilities Board, to be composed of seven members appointed by the Governor, in the event of the Legislature passing a bill abolishing the Public Service and the Gas and Electric Commissions, in which case these bodies would be succeeded by the Public Utilities Board.

Special Committee on Licensing

A special report rendered by the public affairs committee of the Engineering Council on the licensing of engineers was debated at length at the meeting, and led to the decision to appoint a special committee to make an exhaustive study of the situation from a countrywide viewpoint. It is intended that through the work of this committee the Engineering Council shall in due time be prepared to advise engineering organizations in any of the states upon this matter. Engineers who have knowledge of proposed legislation on this subject are requested to communicate with the secretary of the Engineering Council. Information or rumor is already current that possible action in the matter may be taken by the legislatures of Iowa, Ohio, Indiana and Michigan.

At the same meeting the committee on Americanization activities was authorized, as had been requested by Miss Frances A. Kellor, special adviser to the Bureau of Education, to coöperate in the war extension work in an advisory capacity, especially in educational propaganda among mechanics and laborers with whom engineers come in contact through their industrial and professional work.

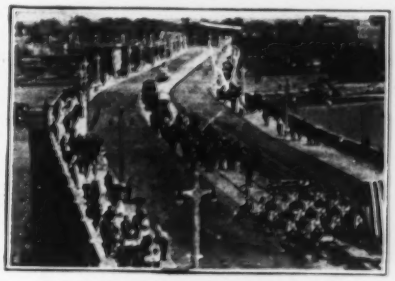
Urge Appointment of Engineer to State Board

The resolution adopted and forwarded to Governor McCall, urging the appointment of at least one engineer to the proposed Public Utilities Board, was passed upon receiving a telegram from Boston engineers that the legislature of Massachusetts was expected to pass a bill abolishing the Public Service and the Gas and Electric Commissions, substituting a Public Utilities Board of seven members appointed by the Governor for five years at $5000 annual salary. The resolution suggests the advisability of the appointment to membership on the board of at least one engineer, "who is qualified by training and experience for such duties as may be required of the members of such a board."

Minneapolis Opens Third Avenue Bridge Built by City

The completed Third Avenue Bridge, Minneapolis, which is located just above the Falls of St. Anthony, was opened and dedicated June 14. The construction of this bridge involved two outstanding features—first, the geographical formation of the river required unusually careful surveys to obtain sound footings for the piers, the bridge finally being located on a reverse curve to avoid break in the limestone cap, 15 ft. in depth, which overlies the sandstone and forms the river bottom at the point where the bridge was constructed, and, second, the structure was built by day labor under the direction and supervision of the city engineer, Frederick W. Cappelen. The accompanying photograph, which was taken when the bridge was dedicated, shows the reverse curve construction.

The first work on the bridge was begun in August, 1914, when construction was started on the first cofferdam for Pier No. 2. In 1912 the city council of Minneapolis engaged an Eastern engineering company to design a reinforced-concrete arch bridge to connect Third Ave. South and First Ave., now Central Ave., Southeast, on opposite sides of the river. Public hearings were held before the War Department in 1913. The water power companies objected to the project. About this time Mr. Cappelen was appointed city engineer. He had previously built six bridges over the river, and refused to approve the location that had been agreed upon. The city council rejected the plan. After some preliminary plans were made for a steel structure under Mr. Cappelen's supervision, an examination of the surveys indicated to him that a line for a bridge could be laid out to avoid these breaks in the limestone, and permitting the use of piers for an arch bridge. Further detailed surveys resulted in the design adopted and built.



PARADE AT BRIDGE OPENING

The assistant engineers on the work, all employed in the city engineer's department, were as follows: K. Oustad, assistant bridge engineer; N. William Ellsberg, superintendent of construction, and, part of the time, J. E. Lawton, junior engineer.

The Concrete Steel Engineering Co., New York, furnished the detailed plans under its original commission of 1912, when the Third Ave. Bridge was first decided upon. This company's resident engineer on the work was Charles F. Bornefeldt.

War Housing Is Placed Under Labor Department

O. M. Eidlitz Will Be Director With Associates From Other Interested Government Bodies

Under authority of the Overman Act the President on June 18 ordered the Secretary of Labor to take over the administration of the war housing activities of the Government, especially the expenditure of the $60,000,000 appropriated May 16. Following the order, the Department of Labor issued a statement from Secretary of Labor Wilson to Otto M. Eidlitz, director of industrial housing and transportation of the department, which read in part as follows:

"The plan of organization approved by me May 4, 1918, shall continue in effect until otherwise directed, except that there shall be associated with the director a representative of the War Department, a representative of the Navy Department, and a representative of the Shipping Board, who shall be known as associate directors. They shall advise the director on behalf of their respective department or board.

"There shall be organized a management division, which shall undertake the management of the properties erected by the Government, and also a division of existent housing, which will deal with the question of utilizing all of the housing and boarding facilities of each community in order to reduce to a minimum the need for Government housing.

"The Government will build, own, control and rent the houses until after the war. The houses erected in established communities shall be of a permanent character, except where Congress has otherwise stipulated. Houses erected in communities that are not likely to continue in existence after the war shall be of a temporary character, but such temporary buildings must, of course, provide for the comfort of the occupants."

Society Reading Room Closed

The board of direction of the American Society of Civil Engineers decided to close the reading room of the society, in the Engineering Societies' Building,

33 West 39th St., New York City, in the evenings during the months of July and August. The decision was made at the meeting of the board held June 18, and conformed to similar action of the library board of the Engineering Societies' Library.

New War Board to Govern Shipping of Freight

The determination of the amount of freight to be exported for war purposes, and the routing from interior points to the seacoast so that congestion will be reduced to a minimum and rapid delivery overseas raised to a maximum, will be governed by an Exports Control Committee recently appointed by the Secretaries of War and the Navy and the Director General of Railroads.

The serious freight congestion has received the close attention of several boards already existing, and a campaign has been on foot for some time to divert some of the freight to the Southeastern and Southern ports. The Inter-Allied Ship Control Committee, of which P. A. S. Franklin is chairman, has done some of the work that will be taken up by the new committee. One of the duties of the latter is the instructing of shipmasters where to call for cargoes. Mr. Franklin will be a member of the new Exports Control Committee, coördinating the two bodies. The War Department will be represented by Major General Goethals, the Navy by Rear Admiral Peoples, and George D. Ogden, general freight agent of the Pennsylvania Railroad, will represent the railroad administration. D. W. Cook has been selected to represent the British, French and Italian traffic interest.

Duties of the Committee

Headquarters will be in Washington, where the various members are now meeting to select a chairman and secretary. The announcement recently issued contains the following: "It shall be the duty of the committee to inform itself (a) as to the probable amount of freight which must be exported for the prosecution of the war; (b) how this war freight can best be routed through the various ports; (c) how much of other essential export traffic has to be handled; (d) the amount of local traffic necessary for each port.

"It shall be the responsibility of the committee to decide the distribution of the combined amount of all exports, as between the various ports, so as to facilitate its handling at, and avoid congestion in, any one port."

The members of the committee believe that it will eliminate the confusion and delay and break up crowded conditions on transportation lines, all of which are factors in the congestion, and will not only be able to expedite the shipment of the manufactured war materials to the allies and our armies abroad, but will also aid in the movement of raw materials and coal to the congested area of the East.

Engineering Council Seeks Aid for Committee Work

The Engineering Council, composed of representatives of member societies and conducting most of its work through committees, is requesting engineers who can help in committee work to write to the council's office, registering their names and addresses and in a general way stating the extent and nature of the service each is willing to render. The council, as was designed, is engaging in numerous activities for the engineering profession of America, many of these activities being directly or indirectly connected with war work. For effectiveness the committees of the council have usually a small number of members, although committee membership is not limited to the representatives on the Engineering Council. Men have been selected for committee membership because of broad knowledge and extended experience in the field assigned to the committee.

Helpers Are Needed

As the work of some committees develops, however, there are occasions when helpers are needed who can devote time to details, to special investigations, to getting local information in some community or state, to compiling and analyzing information already accumulated, or to scouting for men needed for some particular service. When need arises for such assistance it is often difficult to think of or to find the right man available at that moment. In order to meet this difficulty, to give a larger number of engineers shares in the activities, to broaden the council's contact and gain greater breadth for its views and statements, as well as to make its work more widely known, the council is requesting engineers who can help to write to the council's office registering their names and addresses. This is called an opportunity for some of the younger members of the profession to take a hand in society activities, but the request is not limited to younger men. Of course, every one registered may not be called upon, or it may be a long time seemingly before a volunteer is asked for help. On the other hand, calls may come promptly and frequently, and opportunities may be afforded for services of no small value to the profession and the public.

Work of the Committees

To indicate a few lines of the Engineering Council's work, brief statements are given about some of the committees: The public affairs committee reports on matters of public policy, and those relating to national, State or local government, other than technical questions. For example, one question of active interest now before this committee is that of licensing engineers.

The American Engineering Service has the duty of compiling as complete a classified catalog of the engineers of America as it is practicable to get together. Much information has been assembled, but a great deal remains to be collected. During war time lists collected by this committee and the engineering societies coöperating with it are being used to supply thousands of names in response to calls from Government departments for specialists for combatant and other forces of the Army and the Navy and for the war industries. This committee frequently could use volunteers not only in New York but in distant communities; it scouts, also, for men to meet special and urgent calls from the Government, and serves as well in other ways.

The War Committee of Technical Societies is engaged in the examination of new inventions offered to the War and Navy Departments and in stimulation of the development of useful new appliances for warfare. In reviewing ideas received, preparing bulletins and writing reports and records, this committee could make use of a number of helpers from time to time.

The Water Conservation Committee is organizing to deal with questions of policy in various parts of the country concerning the utilization and control of water for such purposes as power development, navigation, irrigation and municipal supply. This committee will need correspondents to aid it in keeping informed or in making special investigations of local laws and policies.

Engineers who are able and willing to take some part in this service for the profession should communicate with Alfred D. Flinn, secretary of the Engineering Council, 29 West 39th St., New York.

Organizing Engineers' Congress in Dutch East Indies for 1919

A general engineering congress to be held at Batavia, Java, Dutch East Indies, in 1919, is being organized by a committee of management under the auspices of the Vereeniging van Waterstaatsingenieurs (Corporation of Engineers of the Department of Public Works) who indorsed the organization to the East Indian section of the Royal Netherlands Institute of Engineers (Koninklijk Instituut van Ingenieurs).

A circular issued by the committee of management states that it should be very profitable to look to other countries, outside the Dutch Archipelago, with the same needs arising out of present conditions, for the solution of many engineering and industrial problams which appear in their own way in the Dutch East Indies, and further says: "Should we be called upon to summon the help of engineers of other countries in the solution of our problems, we are glad to be able to state that the development of technics in this country in many respects makes it possible to let these engineers partake of our experience and the results of our work, by which they can profit in return." It will be the purpose of the

congress to promote this coöperation, to the end of the enlargement of views in matters of mutual interest.

The present plan of the committee of management contemplates dividing the congress into six different sections, as follows: Harbors and means of communication; irrigation, drainage, waterworks, etc.; roads and bridges, town planning, architecture, etc.; production of energy, electricity and industries; mining and geology; and miscellaneous subjects such as technical education.

The officers of the committee of management are M. H. Damme, president, and C. Tellegen, secretary, 21 Molenvliet Oost, Batavia, Java, Dutch East Indies.

DuPont Scholarships to Promote Study of Chemistry

The E. I. du Pont de Nemours Co. has established 18 fellowships and 33 scholarships in chemistry in various colleges and universities throughout the country, according to the statement made by Charles J. Reese, chemical director of the du Pont Co., at the dinner of the sales convention of the du Pont American industries held in Atlantic City June 19. The value of each fellowship is $750 and of each scholarship $350.

Mr. Reese said that the du Pont Co. had decided to take this action because of the growing importance of the chemist in the industries of the world and because of the scarcity of trained men due to the drafts made for the Army and the remunerative offers to men who have not even finished their regular chemical courses in college. He said that there was hardly a big manufacturing industry which did not need men who had taken advanced courses in chemical work.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION; University of Pittsburgh; June 26-29, Northwestern University, Evanston, Ill.

AMERICAN CONCRETE INSTITUTE; 27 School St., Boston; June 27-29, Atlantic City, N. J.

AMERICAN SOCIETY FOR TESTING MATERIALS; University of Pennsylvania, Philadelphia; June 25-28, Atlantic City, N. J.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS; 29 West 39th St., New York; June 26-28, Atlantic City, N. J.

The New Jersey Association of County Engineers made a tour of inspection of Camp Dix, through the courtesy of the officers of the camp, as a feature of the meeting held June 21 and 22 and mentioned in *Engineering News-Record* of June 20, p. 1203. At a regular business session of the meeting reports were received from the "Return Loads Committee," which is coöperating with the Motor Truck Club of New Jersey. The reports included definite information regarding the condition of roads and the capacity of bridges on the routes traveled by motor truck trains and express service in the State. Reports were also made by the committees on standard road direction signs and on specifications. As a result of the discussion of the report of the specification committee, the association was divided into subcommittees of three members each to arrange detailed specifications for all types of pavement for use in New Jersey in State road work. It is the intention of the association to hold the next regular meeting some time in September at a place and date to be announced.

The New England Water-Works Assn., through its executive committee, decided during the outing trip at Pemberton, Mass., on June 19, mentioned in *Engineering News-Record* of June 13, p. 1155, not to hold its usual annual convention in September.

The Oregon Society of Engineers, at the meeting June 20 held in Portland, was addressed by R. J. Grace on the design, construction and behavior of the reinforced-concrete ship.

The Engineers' Society of St. Paul held its annual outing June 15. It consisted of a trip of inspection to the Apple River Dam of the St. Paul Gas Light Co., near Somerset, Wis. The society was formerly the **Civil Engineer's Society of St. Paul.** The new name was adopted when a change was made, at a meeting held May 20, in the constitution and bylaws.

The Allied Engineers' Assn., of Charleston, S. C., held its annual meeting and dinner June 17. The following officers were elected: President, T. M. Gregg; vice-president, M. S. Creytor; secretary and treasurer, John McCrady. Among the speakers were Mayor Hyde of Charleston and Norman Murray Smith of the Charleston Navy Yard, who spoke of the work of the yard and things needed to broaden its scope.

The Engineers' Club of Northern Minnesota was addressed at the meeting of June 15, held at Hibbing, by S. A. Jenkins, chief engineer of the Wisconsin Steel Co., who spoke on "Underground Mine Stations and Pockets." Edward Hawley, village engineer of Hibbing, spoke on the subject of garbage disposal.

The Assn. of Municipal Electrical Engineers of Ontario held its first annual convention at Queen Victoria Park, Niagara Falls, Ont., June 14-15. The association was organized about three months ago and of 184 municipalities which were invited to join 83 have become members.

The Cleveland Engineering Society held its 38th annual meeting on June 14. The meeting was preceded by the annual dinner and was devoted to a discussion of war work.

The Engineers' Club of Harrisburg, Penn., elected its officers for the ensuing year at the annual meeting held June 17. C. A. Emerson, Jr., was elected president, and H. E. Moses, secretary.

The Providence Engineering Society, Providence, R. I., will hold its annual outing at the Oakland Beach Yacht Club June 29. At the meeting held June 17 the society was addressed by Capt. George H. Webb, director of the military draft in Rhode Island, who spoke on war subjects.

The Engineers' Club of St. Paul has furnished the writing and reading rooms of the Army & Navy Club, which has just been established in St. Paul and which is said to have been transformed into one of the finest Army and Navy clubs in the country through the redecorating and furnishing of the old Minnesota Club building, recently abandoned by that club for its new and larger quarters.

PERSONAL NOTES

FLOYD W. ALLEN, consulting engineer, Seattle, will discontinue private practice to become sales manager for the Builders' Brick Company.

GEORGE W. TILLSON has resigned as consulting engineer to the president of the Borough of Brooklyn, New York City. Mr. Tillson has been for many years identified with the engineering work of the Borough of Brooklyn and Greater New York, having become engineer in charge of street pavement in the old City of Brooklyn in 1895. He has also served as chief engineer of the Bureau of Highways of the Boroughs of Brooklyn and Manhattan.

GREGG BLACK has been appointed city engineer of Vicksburg, Miss., succeeding C. R. Twiss, who resigned to enter the engineer corps with the rank of captain, as mentioned in *Engineering News-Record* last week, page 1204.

E. B. ADAMS, of the staff of the city engineer of Grand Rapids, Mich., has resigned to enter the service of the Portland Cement Assn., with headquarters at Detroit.

HARRY L. SHANER has resigned as city engineer of Lynchburg, Va., to accept the office of chief engineer for the John B. McKinney Co., at Lee Hall, Va.

JOHN K. HARRIS and H. W. Cole have formed the partnership of Harris & Cole, consulting engineers, with headquarters at Farrell, Penn. The firm has been appointed to assume the duties of city engineer for Farrell. Mr. Cole will leave the service of the Petroleum Iron Works Co., by which he has been employed for a number of years, to undertake the new work.

CHARLES F. HOWE, consulting engineer, Macon, Ga., who has been identified for a number of years with water-power development in Georgia, has received a commission as major and assigned to duty in charge of public utilities at Camp McClellan, Anniston, Alabama.

DR. D. B. STEINMAN has resigned from the firm of Waddell & Son, consulting engineers, New York City, to devote his entire time to his work in charge of the departments of civil and mechanical engineering, College of the City of New York.

BURWELL BANTZ, formerly county engineer, Island County, Washington, has been appointed city engineer and water superintendent for Chehalis, Wash., succeeding W. G. Peters, resigned.

GEORGE A. JOHNSON, consulting sanitary engineer, New York City, has been commissioned major in the Quartermaster Corps, National Army, and will be attached to the construction division, maintenance and repair branch, with headquarters at Washington.

L. J. PUTNAM has been appointed chief engineer of the Chicago & North Western Ry., succeeding William H. Finley, who has been made president of the company, representing the stockholders, as mentioned in *Engineering News-Record* of last week. F. C. Huffman, resident engineer, succeeds Mr. Putnam as principal assistant engineer.

W. G. GOODWIN has been named as superintendent and chief engineer of the water department, Kansas City, Mo., succeeding Burton Lowther.

ROY G. BUCK has resigned as assistant engineer, Indianapolis Water Co., to become associated with C. H. Hurd, consulting engineer, Indianapolis. Mr. Buck had been engaged as resident engineer on improvements being made at the municipal water plant at Bloomington, Indiana.

E. O. REEDER, assistant chief engineer of the Chicago, Milwaukee & St. Paul Ry., has resigned. The official notice states that: "After many years of faithful and valuable service Mr. Reeder retires on account of ill health."

R. J. MIDDLETON, valuation engineer of the Chicago, Milwaukee & St. Paul Ry., has been appointed assistant chief engineer of the Puget Sound Lines, with office in Seattle, Wash. He succeeds E. O. Reeder, who has retired. T. H. Strate has been appointed to succeed Mr. Middleton, with office in Chicago. F. M. Sloan takes Mr. Strate's place as valuation field engineer, with office in Minneapolis. E. B. Crane is appointed assistant valuation engineer at Chicago.

R. F. WERLEY has resigned from the Concrete Steel Products Co., Boston, to join the engineering staff of the Farris Engineering Co., Pittsburgh, specializing in bridge design and construction.

C. E. HENDERSON, county engineer of St. Johns County, Florida, has resigned to enter the service of the United States Bureau of Industrial Housing and Transportation, Department of Labor, under its chief engineer, John W. Alvord, at Washington.

D. W. HUFFORD, formerly of the Shiel-Chapin Construction Co., Indianapolis, has been engaged as an engineer on the staff of the Public Service Commission of Indiana.

J. T. HALLETT, who was connected with the State Highway Commission of Indiana, dissolved recently by injunction of the State Supreme Court, has become telephone engineer for the Indiana Public Service Commission.

CHARLES GILMAN HYDE, professor of sanitary engineering, University of California, has received a commission as captain in the Sanitary Corps of the National Army, and left the university June 21 to report at Fort Oglethorpe, Georgia. In addition to his work at the university, Professor Hyde has been active in the practice of sanitary engineering and has been identified with many of the important sanitation problems in California, particularly those involved in the purification of water supply.

RUSSELL A. TRUFANT has resigned as office engineer of the Cameron County Water Improvement District No. 2, San Benito, Tex., to become chief of party on the Rio Grande Project, United States Reclamation Service, at Clint, Texas.

OBITUARY

HOWARD L. COBURN, consulting engineer, who had specialized for a number of years in the design and construction of dams, died in New York City June 19. Mr. Coburn, who was 52 years old, was born in Patten, Me., and was graduated from the Massachusetts Institute of Technology in 1887. From the time of his graduation until 1904 he devoted himself largely to the design of cotton mills, mill machinery and power plants in New England. In 1905 Mr. Coburn became chief engineer for the Ambursen Hydraulic Construction Co., New York City. Among his most important works were the Guayabal dam for the United States Irrigation Service in Porto Rico, the Bassano dam across the Bow River in Alberta for the Canadian Pacific Ry., and the Jordan River dam at Vancouver Island, B. C. In this country Mr. Coburn had charge of the design and construction of the Shoshone and Laprelle dams in Wyoming, the dam at Akron, Ohio, and the Pittsfield dam at Pittsfield, Mass.

WILLIAM RYAN HILL, who had been identified for a number of years with state and municipal engineering projects in New York, died at his home in Albany June 16. In 1908 Mr. Hill retired from the office of special deputy state engineer of New York owing to political changes, and opened an office as a consulting engineer in Albany. His first engineering work was done in 1872 on road construction in Westchester County, New York. Afterward he assisted on surveys for an elevated railway in Brooklyn and for harbor improvements at Port Morris. After a brief connection with the Housatonic & Northern R. R. he was placed in charge of the construction of tunnels on the Harlem R. R. Later he was engaged in railway work on Long Island and elevated railway and boulevard construction in New York City. As division engineer of the Boston, Hoosac Tunnel & Western R. R., he had charge of the general equipment, engine houses and shops of the Saratoga branch of that line, which was built under his supervision. Still later he was engaged on surveys of the Croton River watershed and afterward became a member of the staff of the late J. James R. Croes, who was engaged at that time in elevated railway work in New York City and on projects for a new water-works system at Syracuse. He became Mr. Croes' principal assistant in the latter undertaking, and in 1889 was appointed its chief engineer. The new water-works were built and managed under his direction until late in 1899, when he became chief engineer for the Croton Aqueduct Commission. Shortly after assuming that office, he recommended the substitution of a masonry structure for a part of the new Croton dam originally designed as an earth embankment, and after investigation by a board of consulting engineers this recommendation was adopted. In July, 1903, he resigned this position to engage in private engineering work, but in January, 1907, he again accepted public office as special deputy state engineer of New York.

DANIEL B. DONOVAN, for several years resident engineer for the New York State Barge Canal at Rome, N. Y., was recently killed by a locomotive near Camp Merritt, N. J., where he was employed as superintendent of road construction for W. H. Fissell & Co. Subsequent to his work as resident engineer for the barge canal, Mr. Donovan engaged in contracting work on several New York State highways.

NEWS OF ENGINEERING INDUSTRIES

FOR MANUFACTURERS WHO SERVE ENGINEERS AND CONTRACTORS

Government Regulation of Building Trades

Laboring Under Increased Difficulties, They Urge Relief Through Government Action

Some form of Government regulation of the building industries either by appointment of a director or assistance through Congressional action is, in the opinion of the officials of that trade, necessary for the solution of the extreme difficulties involving the entire business. Such action is provided in the urgent deficiencies bill, passed by Congress for the fiscal year ending June 30, 1919, which states that the bill amends the act authorizing the housing project by conferring authority on the President, in his discretion, to handle this question through a corporation to be organized under the laws of the District of Columbia. Governmental fixing of prices and other minor regulations have already occurred, which the builders say have tended to increase rather than diminish the difficulties, in the absence of complete direction by the Govenment.

The $60,000,000 item in the deficiency bill to provide housing for war workers throughout the United States, by far the largest item in the bill, gives an evidence of the heavy demand made on the industry by the Government and represents only a fraction of the total demand. The demand has exceeded the supply, as is shown in a report from the West Coast Lumbermen's Assn., to the effect that in a recent period western Oregon and Washington shipped 24,300,000 ft. more than they were able to cut and accepted orders for 4,600,000 ft. more than they shipped. The labor and fuel shortage reduced the production and stocks to an unprecedented degree, so that, with contracts that have run over from preceding periods, the tremendous increase in population in war manufacturing centers, producing the housing demand, and other inroads on stocks, have forced contractors to offer almost any price in order to get the material. These conditions have resulted in high prices throughout the list.

The case of window glass will illustrate how depleted stocks will produce an automatic advance in price. The production has been extremely late, yet all the factories are practically closed down by this time. The supply will be reduced still further by short production resulting from the 50% fuel reduction order effective until Dec. 31, which, together with the increasing difficulty of obtaining raw material, will reduce the stocks to an extremely low level. Should there be an extra heavy emergency demand it will be necessary to cut into the large sheets, the price of which will necessarily make the smaller panes cost more.

The situation in lumber is the same, the cutting of smaller sizes from large stock being but one of the many factors and the rise in price has produced adverse criticism, the dealers being accused of profiteering.

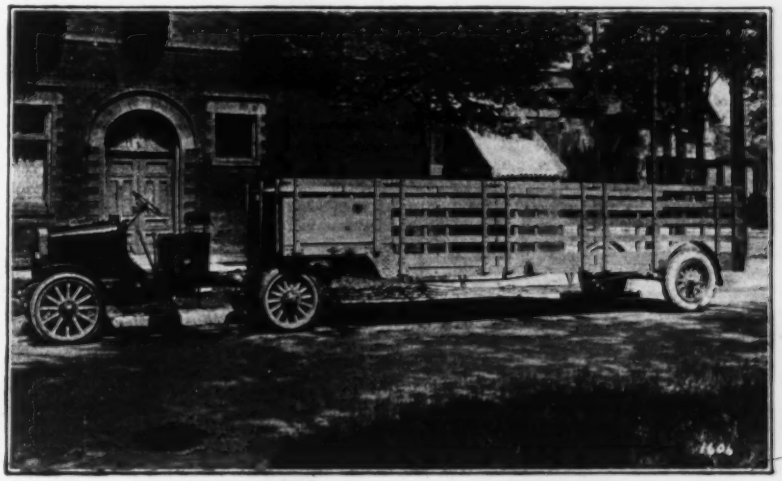
The lumbermen, however, are very anxious to show that this has not been the case, several of the largest concerns having had their books carefully audited by the Federal Trade Commission, and recommendations from that board have been handed to the price fixing committee of the War Industry Board. These reports have shown that prior to the control of the labor supply by Government employment bureaus the industries were subjected to strong competition in the labor market from neighboring shipyards, cantonments, and other Governmental work.

(Concluded on page 1253)

Delivery of Airplanes by Motor Truck and Trailer

The hauling of an entire airplane by motor truck, when it is desired to move it from one place to another without using its own power, is another development of the war.

In the accompanying illustration the truck is a light tractor manufactured by the Acason Motor Truck Co. and the trailer is of 3-ton capacity and 45 ft. long and 7 ft. wide, with racks 48 in. high. It is equipped with pneumatic tires.



MOTOR TRUCK AND TRAILER FOR AIRPLANES

War Board Asks $200,000,000 to Increase Power Supply

A bill drafted by the War Industries Board and sent to Congress embodies an appropriation of $200,000,000 for the purpose of increasing the power supply in overloaded industrial centers of the East. The proposed measure was drafted by the War Industries Board at the request of the chairman, Bernard M. Baruch, and is said to have the backing of President Wilson.

It is an emergency measure and, it is stated in Washington, will be local in effect because the power supply of the East is greatly overloaded and will require first attention, after which it is the intention of the War Industries Board to care for other sections of the country, in similar difficulties, by additional legislation and appropriations, if possible. It is also stated in Washington that power companies with insufficient equipment or funds had expected assistance through the War Finance Corporation; but since that body has ruled that industries must borrow through the banks it will create a dangerous situation in that additional equipment, which might not be needed after the war, would be unable to give sufficient return on the capital invested. It is, therefore necessary, it is reported in Washington, to obtain capital in the manner of the proposed bill.

No plans for distributing this capital have been formulated by the board, but it is said that eventually much more than the $200,000,000, as now proposed, will be needed, because in the Pittsburgh district alone between $40,000,000 and $50,000,000 for additional plant facilities will probably be needed.

Motor Trucks to Relieve the Railways Further

Return Loads Bureaus To Increase Still More the Efficiency of Motor Truck Freight Hauling

Return loads bureaus have been established by the highway transport committee of the Council of National Defense at Washington, further to relieve shippers of the difficulties and delays resulting from freight and express embargoes and a shortage of freight cars. Although the cities, shown in the accompanying table, in which bureaus have been established, are mostly in New England, New York and New Jersey, the activities of the movement are to be extended throughout the territory north of the Potomac and Ohio Rivers and east of the Mississippi, where transportation conditions and freight congestions are most serious.

The function of these bureaus is to put cities in touch with truck operators, who can render service in intercity hauling. Complete information, such as card index lists of operators, trips, routes by the trucks, list of merchants and manufacturers who have goods to ship, is kept in the various headquarters of the local bureaus. By reciprocal arrangements with bureaus in other cities, any merchant who is taking advantage of this service may obtain advance information of any trucks returning to a point to which he wishes to ship. When the truck arrives the driver reports to the association and gets the name and address of the shipper, after which arrangement of terms and conditions for the service is left entirely to the operator of the truck and the shipper.

The advantages of this arrangement are that reduction in the cost per ton by moving freights in both directions is effected, shipments can be made from and delivered to the doors of the consignees, eliminating drayage at both ends, and the crating of many kinds of goods as well as loss and breakage is reduced to a minimum. Shippers are able to deliver a load of goods at a distance within a few hours or over night, which would be impossible by rail. The use of these trucks in this manner liberates thousands of freight cars for the movement of essentials directly relating to the needs of the War and Navy Departments, the Shipping Board, fuel administration and food administration. These considerations, it is urged by the Highway Transport Committee, make it a patriotic duty and a war time necessity for all shippers using motor trucks, and motor truck companies, to coöperate fully with the return load bureaus. Waste will be reduced in that there will be no wear on the road without a corresponding return of essential work accomplished.

Shipments are not confined to short hauls. Through shipments can be made from Boston to Philadelphia, Baltimore and Washington, as a Boston-New York trucking company has arranged with a New York-Philadelphia company to interchange goods in New York. Similar arrangements are being made for shipments between Rochester, Syracuse, Cleveland, Toledo and Detroit. Goods in transit can be insured in the usual way, and the rates charged for the hauling are about the same as regular express rates, but liberal use of the return load bureaus will bring about a material reduction.

Deliveries along the Atlantic coast will be made directly to seaports, but in the Middle West the trucks will deliver to the Lake ports and also act as feeders to develop the transportation facilities of the great inland waterways.

The Federal Government itself has established an automobile truck parcel post route between New York City and Portland, Me. The service will be inaugurated July 1, as announced by the postal authorities, the route lying through Danbury, Waterbury and Hartford, Conn., Springfield, Worcester, Lowell, Mass., and Portsmouth, N. H. Seven trucks will be operated and the running time between the terminals will be about 2½ days.

The list of bureaus already established for the benefit of shippers and truck owners and to insure the greatest efficiency of transportation by highway, is shown in the table that is printed above.

RETURN LOAD BUREAUS ALREADY ESTABLISHED

City	Location	Telephone Number
CONNECTICUT		
Bridgeport	Chamber of Commerce	Noble 250
Bristol	Chamber of Commerce	100
Danbury	War Bureau or Chamber of Commerce	1308 or "RETURN LOAD"
Greenwich	War Bureau	
Hartford	Chamber of Commerce	Charter 1856 or "RETURN LOAD"
Manchester	War Bureau	489 or "RETURN LOAD"
Meriden	Chamber of Commerce	242 or "RETURN LOAD"
Middletown	War Bureau	1245 or "RETURN LOAD"
New Britain	Chamber of Commerce	1533 or "RETURN LOAD"
New Haven	War Bureau	
New London	War Bureau	1642 or "RETURN LOAD"
Norwalk	War Bureau	69 or "RETURN LOAD"
Norwich	Chamber of Commerce	1747 or "RETURN LOAD"
Stamford		
Waterbury	War Bureau	3570 or "RETURN LOAD"
MICHIGAN		
Detroit	Board of Commerce	
NEW JERSEY		
Asbury Park	Board of Commissioners	2100
Kearny	State Council of Defense	
Dover	Chamber of Commerce	
Garfield	Police Station	
Jersey City	Chamber of Commerce	1110 Montgomery
Millville	Maurice River Transportation Co	225
Montclair	Police Department	
New Brunswick	Home Defense League	1784
Newark	Motor Truck Club of New Jersey	7945 Market
Trenton	Chamber of Commerce	2128
NEW YORK STATE		
Buffalo	Chamber of Commerce	
New York City	Merchants Association, Woolworth Building	7660 Barclay
Syracuse	Chamber of Commerce	
OHIO		
Cleveland	Chamber of Commerce	
PENNSYLVANIA		
Philadelphia	Chamber of Commerce	
RHODE ISLAND		
Providence	Chamber of Commerce	

Progress of Americanization in Various Industrial Centers

The Americanization of foreign industrial workers throughout the United States is making rapid progress. A recent report of the Chamber of Commerce of the United States of America gives data on activities in cities widely distributed, practically representing the whole United States. Some of the cities are doing marked work along this line either in conjunction with the local boards of education or with the Americanization committees of the various chambers of commerce.

The cities mentioned in the report are Auburn, N. Y.; Benton Harbor, Mich.; Hibbing, Minn.; Long Beach, Calif.; Los Angeles; New Philadelphia, Ohio; Phoenix, Ariz., and Pittsburgh. The work in Los Angeles and Pittsburgh is called especially efficient. The educational work in Los Angeles includes "eight to 10 day schools for foreign children, with specially trained teachers; 23 elementary evening schools, and four evening high schools with classes in English; 10 afternoon classes for foreign-born women, for instruction in English, cooking and sewing; 11 neighborhood center schools, to meet the social needs of the old and young in the immigrant districts; four home teachers proficient in foreign languages and in the daily business relationships of the foreign born who visit their homes, adjust their problems and promote an American standard of living; and classes in naturalization, in coöperation with the Federal authorities."

In Pittsburgh, recently two thousand persons, mostly foreign-born, attended an Americanization meeting held in Soldiers' and Sailors' Memorial Hall under the auspices of the Chamber of Commerce.

Though not all of the cities mentioned have progressed to the point mentioned in Los Angeles, they are all planning to do so, taking the first steps in arranging patriotic meetings for foreigners.

Government Regulation of Building Trades

(Concluded from page 1251)

This, with the priority restrictions on fuel, and other embargoes, increased the cost of manufacture to an unprecedented extent. It advanced 20 to 25% at the source, the high cost of shipping and subsequent handling making it from 80 to 85% to the trade, in spite of the fact that, in some cases, profits were actually reduced. The advance, they assert, is not high, especially when compared to the advance in steel, which, though fixed by Governmental action, is from 100 to 400% higher than the pre-war normal level.

The present Government contracts for lumber are based on a replacement basis, wherein the Government will either replace the lumber they have taken or will pay for it at prevailing market prices, and under these replacement clauses the dealers receive a certain amount for handling, the price to be paid for the various items being fixed by a Government schedule. The dealers said original prices in this were so inadequate that it was necessary for them to lay the matter before the War Industry Board and several revisions have been made.

Expect Increased Demand

The recent proclamation by the War Industry Board and the fuel and railroad administrations that no new orders for war materials would be placed in the East when such action can be avoided, will also increase the demand, because, although the action was taken primarily to relieve the congestion of the railroads, it is the outcome of a campaign and the result will be the diversion to the South and Southwest of a large amount of the orders now burdening the Eastern plants. This curtailment of expansion will reduce the demand in the East, but it will be more than offset by the further demand for building material for housing and plant construction in these localities.

In addition, there is an immediate foreign demand, as shown in reports from England on the housing situation in Great Britain, which is such that definite financial proposals have been made for subsidizing the national house-building scheme in the United Kingdom. In spite of the objections to building under war conditions, the time will come when a start will have to be made whether peace has arrived or not, according to a statement recently made in the *Timber Trade Journal*, London. It is reported that a serious state of affairs exists in the eastern district of London, due to the crowding together of houses and factories in narrow streets and the high rate of infant mortality. Definite proposals have been submitted for the erection of 12,000 additional houses at once.

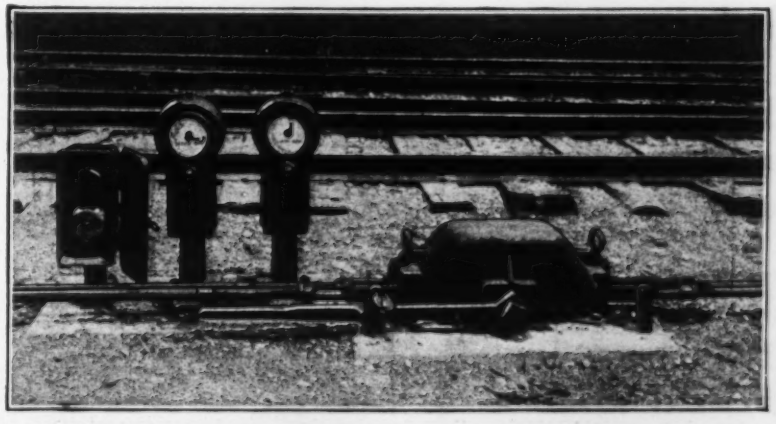
In Italy the war has destroyed the native lumber supply to such an extent that for about fifteen years no lumber will be cut in Italian forests. Even if the war should end in a year or two, Italy's immediate import demand would be 2,000,000,000 ft. b.m. per year, and the demand the first year will run up to twice that amount if the prices return to approximately the pre-war level, but it will not run below the 2,000,000,000 minimum. The demand on the United States will not be confined to Southern pine, as heretofore, but will include spruce, hemlock, cypress, redwood, Oregon pine or Douglas fir, and white oak. F. T. S. Dumont, American consul at Florence, states, moreover, that if American lumber dealers are interested, they should take immediate steps to forestall a return of the demand to Austria, where it went before the war.

The pressure of the demand is shown by the advancing prices. The War Industries Board is considering fixing of prices, on the ground that the private consumer, as well as the Government, must be protected. The lumbermen and the building industries protest, however, that they are ready to do all in their power to assist the Government in its war activities, and serve the general trade at the same time. They request that their position be studied, all the facts obtained and prompt remedial action be taken, either by the appointment of a building administrator or by the granting of a Governmental subsidy.

Switchstand Has Simple Lock Mechanism

Operation of a switch and its facing-point lock by a single lever connected to locking mechanism consisting of only three parts is the function of the switchstand shown in the accompanying view. It is of the drop-lever type, the lever being connected to a link working in the yoke-shaped ends of the switch and lock operating rods which lead out at opposite ends of the switch-stand.

The machine is shown installed at a siding on track equipped with automatic signals. It may be used at ordinary and slip switches, and in connection with a derailing device. When employed at a crossover it is placed midway between the switches, and one movement of the lever serves to unlock, throw and lock both switches simultaneously. The device is known as the "safe lock" switch machine. It is the invention of Charles F. Jones, and is built by the Safe Lock Switch Machine Co., Lexington, Ky.



ONE MOVEMENT OF LEVER OPERATES SWITCH AND SWITCH-LOCK

Business Notes

Following the announcement of a court action involving the Buffalo Pitts Co., a meeting of the creditors and stockholders of the company was held in Buffalo, June 25, for the purpose of considering its affairs.

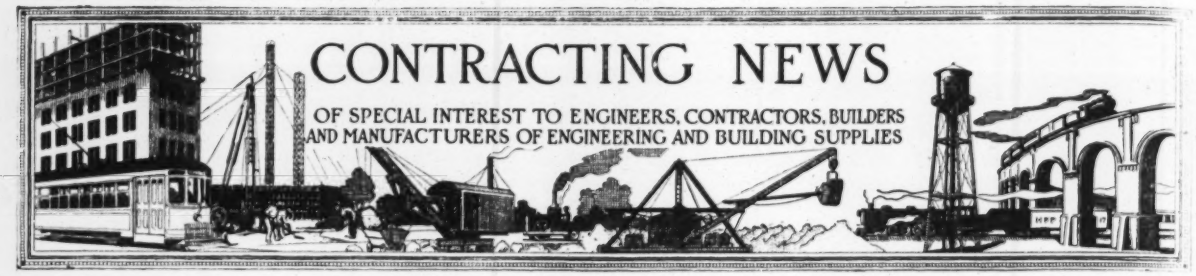
At a special meeting of the stockholders of Freyn & Co. it was decided to change the firm name to Freyn, Brassert & Company.

The Continental Pipe Manufacturing Co., organized under the laws of the State of Washington, has purchased the plants of the following concerns: The Pacific Coast Pipe Co., Seattle, Wash.; the Washington Pipe Foundry Co., Tacoma, Wash.; the National Tank Pipe Co. (pipe dept. only), Portland, Ore., and the Portland Wood Pipe Co., Portland, Oregon.

Trade Publications

"Scientific Industrial Illumination" is the title of a 36-p. illustrated booklet recently issued by the Holophane Glass Co., 340 Madison Ave., New York City.

The Lakewood Engineering Co., Cleveland, has issued Bulletin No. 32 on the "Universal" Mixer, formerly known as the Marsh-Capron Universal Mixer.


CONTRACTING NEWS
OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS
AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

Proposals

For Proposals Advertised See Pages 53-56 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
June 28	New York, N. Y.	June 27
July 3	Ft. Lee, N. Y.	June 20
July 10	Spanish Fork, Utah	June 27
July 16	Livingston, Mont.	June 27

SEWERS

July 2	Long Island City, N. Y.	June 27
July 2	New York, N. Y.	June 27
July 2	Welland, Ont.	June 27
July 3	Newton, Kan.	June 20
July 8	Montezuma, Ia.	June 27
July 10	Dearborn, Mich. Adv. June 27.	June 27
July 10	Bridgeport, Conn. Adv. June 13.	June 13

BRIDGES

July 1	Chittenango, N. Y. Adv. June 27.	June 27
July 9	Worthington, Minn.	June 20
July 10	Middlebourne, W. Va.	June 27
July 24	Clarksburg, W. Va.	June 27
July 31	Santa Domingo Adv. May 16.	May 16

STREETS AND ROADS

June 29	Grangeville, Idaho	June 27
June 31	Oswego, Kan.	May 16
July 1	Chicago, Ill.	June 6
July 1	Chicago, Ill.	June 27
July 1	Martinez, Cal.	June 20
July 1	Hamlin, W. Va.	June 20
July 1	English, Ind.	June 20
July 2	Pennsylvania	June 13
July 2	Grand Junction, Colo.	June 27
July 2	New York, N. Y.	June 27
July 2	St. George, S. I., N. Y.	June 27
July 2	Omaha, Neb.	June 27
July 2	Boston, Mass.	June 27
July 3	Cleburne, Tex.	June 13
July 3	Brooklyn, N. Y.	June 27
July 3	Rhode Island Adv. June 20.	Jnue 20
July 3	Canyon City, Ore.	June 27
July 5	Wilkes Barre, Pa.	June 20
July 5	Akron, O.	June 27
July 8	Washington.	June 27
July 8	New York, N. Y.	June 27
July 8	Bowman, N. D.	June 27
July 8	Liberty, Tex.	June 13
July 8	Chaska, Minn.	June 13
July 8	Williamson, W. Va.	June 27
July 8	California	June 27
July 9	Sharon, Pa.	June 13
July 9	Sharon, Pa	June 6
July 10	New Jersey. Adv. June 27.	June 27
July 11	Harvey, N. D.	June 27
July 11	Pennsylvania	Jun 27
July 12	Libby, Moat.	June 27
July 12	White Sulphur Springs, Mont.	June 27
Aug. 1	Cleveland, O.	Mar. 28
Aug. 15	New Mexico. Adv. June 27.	June 27

EXCAVATION AND DREDGING

July 1	Glencoe, Minn.	June 20
July 1	Mason City, Ia.	June 27
July 2	Greenville, Miss.	June 6
July 3	Sibley, Ia.	June 27
July 6	Marshall, Minn.	June 27
July 9	Rockford, Ill.	June 27
July 15	Winchester, Ill.	June 27
July 23	Albany, N. Y. Adv. June 27.	June 27

INDUSTRIAL WORKS

June 30	Reading, Pa.	June 27
July 1	Chicago, Ill.	June 13
July 2	Pompton Lakes, N. J.	June 20
July 3	Oxford, N. Y. Adv. June 20.	June 20

BUILDINGS

July 1	Baxter Springs, Kan.	June 27
July 1	Chicago, Ill.	May 23
July 1	Sioux Falls, S. D.	June 13
July 1	Beloit, Wis.	June 20
July 1	Stevens Point, Wis.	June 27
July 2	Phillips, Neb.	June 20
July 9	Manhattan, Kan.	June 13
July 9	Remembrandt, Ia.	June 27
July 10	Sioux City, Ia.	June 20
July 10	Brooklyn, N. Y.	June 27
July 10	Watertown, N. Y.	June 27
July 12	Akron, O.	June 27
July 15	Phila., Pa.	June 20
July 15	Cattaraugus, N. Y.	June 27
July 20	New York, N. Y. Adv. June 27.	June 27

FEDERAL GOVERNMENT WORK

June 28	Barracks — Spec. 3052 — Portsmouth, N. H.	June 27
July 1	Repairing Runway — Spec. 3132—New London, Conn.	June 27
July 1	Buildings — Spec. 3045 — Indian Head, Md.	June 27
July 1	Recess and Machinery — Wheeling, W. Va.	June 13
July 1	Sprinkler System — Spec. 3068—Mare Island (Vallejo P. O.) Cal.	June 13
July 1	Fitting Out Pier and Slip-Spec. 3060—New York, N. Y.	June 20
July 1	Storehouses and Magazines —Spec. 2990 — Hingham, Mass.	June 20
July 1	Extension to 2nd Locomotive House—Lake Denmark, N. J.	June 20
July 1	Hangar — Beach, Pier — Spec. 3112—Key West, Fla.	June 20
July 1	Heating Mains—Spec. 3094 —Norfolk, Va.	June 20
July 1	Annex Buildings, Etc.— Spec. 3063—Philadelphia, Pa.	June 20
July 1	Boiler—Spec. 3121—New London, Conn.	June 20
July 1	Underground Heating Mains—Spec. 3094—Norfolk, Va.	June 20
July 1	Emergency Hospital—Spec. 3070—Norfolk, Va.	June 20
July 1	Landing Beach—Spec. 3031 —Washington, D. C.	June 20
July 1	Seaman Guard Unit—Spec. 3082—Great Lakes, Ill.	June 20
July 1	Canal Wall—Washington D. C.	June 20
July 1	Generating Plant, etc. — 3129—Norfolk, Va.	June 27
July 1	Dispensary — Spec. 3113— Washington, D. C.	June 27
July 1	Railroad Extension—Spec. 3100—Washington, D. C.	June 27
July 1	Chemical Laboratory—Spec. 3096—Indian Head, Md.	June 27
July 2	Boiler—Washington, D. C.	June 27
July 3	Levee Work—St. Louis, Mo. Adv. June 6.	June 6
July 5	School—Ft. Yates, N. D.	June 6
July 5	Dredging and Rock Removal—New York, N. Y.	June 13
July 8	Mechanical Equipment — Spec. 3048 — Philadelphia, Pa.	June 27
July 8	Grading — Washington, D. C.	June 27
July 8	Fill, Pavement, etc.—Spec. 3076—Pensacola, Fla.	June 27
July 8	Officers Material School— Spec. 3090 — Great Lakes Ill.	June 27
July 15	Water System—Spec. 3071 —San Diego, Cal.	June 27
July 16	Canals—Clint, Tex.	June 27
July 18	Post Office—Eldorado, Kan.	June 27
July 18	Supply and Distributing Systems—Shiprock, N. M.	June 27
July 19	Dredging — Philadelphia, Pa.	June 27
July 19	Jetty Repairs—Wilmington, Del.	June 27
July 22	4 Radio Buildings—Spec. 3069—Haiti	June 20

MISCELLANEOUS

July 1	Dam and Flume—Elora, Ont.	June 27
July 3	Straightening River—Corning, Ia.	June 27
July 5	Dock—Yoman, Wash.	June 27
July 6	Flood Control Work— Dayton, O.	June 20

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER WORKS

Proposed Work

N. Y., Poughkeepsie—City election June 28, to vote on $65,000 bonds to improve and repair water-works equipment. Project includes installation of 1 low lift and 1 high lift motor driven pump, 5,000,000 gal. capacity, each. E. W. Sylvester, supt. pub. wks.

Ky., Louisville—Bd. Water Comrs. soon let contract building and installing new pumping engine for Crescent Hill pumping sta., 30,000,000 to 40,000,000 gal. daily capacity. D. R. Syman, city engr.

Ill., Hillsboro—City election July 2 to vote on $14,000 bonds to improve water-works.

Water-Works (Continued)

Ill., Jacksonville—S. A. Greeley, engr., 64 West Randolph St., Chicago, receives bids about Aug. 15, building earth dam 500 ft. long, 22 ft. high, concrete spillway channel and filter plant here. About $75,000. Noted June 6.

Ill., Witt—City voted $30,000 bonds to improve water works. H. Hammond, clk. Noted May 16.

Minn., Foley—City having plans prepared for water-works system to include installation of deep well, 60,000 gal. steel tank pump with 1000 gpm. motor. G. E. Rice, mayor.

Minn., Forest Lake—Village having plans prepared building water works system. About $30,000. J. F. Druar, 312 Commercial Bldg., St. Paul, engr. Noted June 6.

Minn., Westbrook—See "Sewers."

Kan., Garnett—City soon receives bids for water and light equipment. Bonds for $65,000 voted for project. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs. Noted May 16.

Tex., Coleman—City plans to expend about $100,000 on water-works system. Project includes storage dam, pumping station, etc.

Tex., San Antonio—City plans to build artesian wells in connection with water-works system. About $12,000. H. Helland, city engr.

Okla., Ryan—City plans to build filteration plant.

Colo., Canon City—City retained G. H. Sethman, engr., 249 Equitable Bldg., Denver, to prepare plans for water-works improvements.

Wash., Bellingham—Bd. Water Comrs. received no bids June 6, building 48 in. main at Larsen Sta. to connect with existing 24 in. main. Work involves 2200 ft. 48 in. cement pipe, 6000 cu.yd. earth and 2000 cu.yd. rock excav. C. M. Adams, city engr. Noted May 30.

Cal., Corcoran—City issued $70,000 bonds to purchase water system. Plans include drilling well and installing steel tank and distribution system. L. M. Stone, city engr. Noted June 6.

Cal., Redding—Happy Valley Irrigation District voted to issue $615,000 bonds to improve and extend system to supply every acre in 18,000 district with water. About $250,000 to be spent for immediate needs, balance to be spent after war. E. B. House, city engr.

Cal., Tracy—See "Sewers."

BIDS DESIRED

N. Y., New York—Until June 28, by N. J. Hayes, comr. water supply, gas and electricity, Municipal Bldg., furnishing, delivering, unloading, stacking and storing valves; hauling and laying water mains and appurtenances in 5th Ave. to connect with shaft No. 18 of city tunnel, Catskill Aqueduct and for cross connecting existing trunk mains in B'way., Central Park West, Amsterdam, Columbus, 8th and 9th Aves. and 42nd St., (Manhattan Boro); hauling and laying cast and wrought iron water mains and appurtenances across Alley Creek at Jackson Ave. (Queens Boro).

Mont., Livingston—Until July 16, by City, building concrete reservoir with 1,000,000 gal. capacity. C. T. Sacket, city engr.

Utah, Spanish Fork—Until July 10, by D. E. Robertson, city recdr., building rein.-con. reservoir with 700,000 gal. capacity.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. C., Charlotte**—Bd. Pub. Wks. let contract furnishing pump and motors for Irwins Creek Pumping Sta., to Morris Machine Co., Realty Bldg. About $7000 Noted May 16.

O., Ravenna—City received low bids building filtration plant, from E. E. Morgan, Ravenna, $55,082; F. George, 5301 Columbo St., Pittsburgh, Pa., $58,023; Alger & Crouse, 701 Guardian Bldg., Cleveland, $60,231. Noted June 6.

★**Okla., Prague**—City let contract improving water works and electric light plant, to Oklahoma Electric Supply Co., 120 West Main St., Oklahoma. Work involves station, substation wiring and street lighting equipment including 21½ mi. transmission line. Motor driven pumps, automatic starting and stopping, and air compressors for air lifts, to Amer. Well Wks. Co. and Gorden-Govern Co. Noted Apr. 18.

Wash., Seattle—Bd. Pub. Wks. received low bids laying 9200 ft. 8 in. wood stave pipe in 35th Ave., S. W., from F. M. Badolato, 1642 Lane St., $18,104; Scalzo & Co., 1708 22nd Ave., S., $18,720; Erickson & Young, 5610 10th Ave., N. E., $21,917.

★**Ont., Toronto**—Bd. Control let contract furnishing feed water heaters at main and high level water-works pumping stations, to A. S. Letch & Co., Kent Bldg. Noted Apr. 4.

★**Ont., Toronto**—Bd. Pub. Wks. let contract furnishing one 5,000,000 gal. centrifugal pump, to Bawden Pump Co., Ltd., Toronto.

SEWERS

Proposed Work

N. J., Haledon—Boro. retained H. J. Harder, engr., Patterson, to prepare plans for sewerage system and sewage disposal plant.

N. J., Morristown—Town plans to build sewerage system. About $25,000. Work includes 1-story, 12 x 25 ft. brick valve house, 3 sand filters and involves 2000 ft. 18 in. tile. P. S. Pierson, Trust Co. Bldg., town engr.

Ill., Mendota—City soon lets contract building sewerage system. About $70,000. W. Duetchler, city engr.

Minn., Westbrook—City plans to build sewerage and water works systems. About $12,000. Work includes Imhoff tank, laying water and sewer mains, etc. Rose & Harris, 417 Auditorium Bldg., Minneapolis, engrs.

Mont., Scobey—City soon lets contract extending sewerage system. About $100,000.

Idaho, Moscow—J. H. Strong, city clk., received no bids June 10, building sewer pipe line and sewage treatment plant. About $75,000. Noted May 30.

Wash., Spokane—City having plans prepared by A. D. Butler, city engr., building sewers in 15th Ave. from Monroe to Cedar Sts. and Cedar St. from 14th to 15th St.

Cal., Los Angeles—Bd. Pub. Wks. soon lets contract building vitr. pipe sanitary sewer in 36th St. from Pacific to Kerckhoff Aves. A. C. Hansen, city engr.

Cal., Los Angeles—City plans to build sewer in Savannah St. between New Jersey and Brooklyn Aves. A. C. Hausen, city engr.

Cal., Newport Beach—City had plans prepared by P. E. Kressly, city engr., for sewer system and sewage disposal plant. About $110,000. Septic tanks will be installed. Noted May 30.

Cal., Tracy—City sold $15,000 bonds to build sewer and water works systems.

Cal., Venura—City election July 30 to vote on $15,000 bonds to build outfall sewer.

BIDS DESIRED

N. Y., Long Island City—Until July 2, by M. E. Connolly, boro. pres., (Queens Boro), building sewers and appurtenances in portions of Alburtis, Corona, Barkins, Perry, Maspeth and Clermont Aves., Broad St. and Remsen Pl., 2nd Ward; Idaho and Joslin Sts. and Kendall Pl., 3rd Ward; Troy and Cottage Sts., 4th Ward; park inlet basins and appurtenances on northeast, southeast and southwest corners of Beach 118th St. and Rockaway Beach Blvd., 5th Ward.

N. Y., New York—Until July 2, by H. Bruckner, boro. pres., (Bronx Boro), building sewers and appurtenances in portions of Balcom, Appleton, Mayflower, Morris Park and Wilkinson Aves. together with storm water overflow in Latting St. between Westchester Creek and Balcom Ave.; in Riverdale, Johnson and Netherland Aves., West 238th and 239th Sts.; in Sagamore St. and Birchall Ave. together with temporary connection from west side White Plains Rd. to Sagamore St. to intersection of Sagamore St. and Cruger Ave.; for completing abandoned contract executed by Wm. Baker, Inc., Apr. 19, 1916, and abandoned Apr. 16, 1918, for building sewers and appurtenances in Westchester, Blondell, Sacket, Seymour, Allerton, Wilson, Adee, Throop and Burke Aves. and Eastchester and White Plains Rds.

Mich., Dearborn—Until July 10, by F. C. Reamer, village clk., building sewerage system involving 66,000 ft. 8-24 in. pipe, manholes, sewage treatment plant and pumping stations. C. W. Hubbel, 2348 Penobscot Bldg., Detroit, consult. engr.; advertised in this issue. Noted May 30.

Ia., Montezuma—Until July 8, by C. F. Dickson, town clk., for complete sewage treatment plant consisting of Imhoff tank, concrete dosing chamber, etc.; also building outlet sewer involving 1425 ft. 15 in. vitr. sewer pipes part of which is to be obtained by taking up present 15 in. outfall sewer which was apparently laid with uncemented joints, remainder to be built using new vitr. sewer pipe. J. H. Dunlap, Iowa City, consult. engr.

Ont., Welland—Until July 2, by D. M. Stapf, city clk., building 1692 ft. 10 and 12 in. sewer in Lincoln, Elizabeth and Alexander Sts. and Oakland and Maple Aves. D. T. Black, city engr. Noted June 13.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Bd. Pub. Wks. let contract building pipe sewer in Causeway St. from Beverly to Leverett Sts., to T. Coughlin, Boston, $4813; Leverett St. from Charles to Green Sts., to V. Grande, Boston, $9724; Portland St. from Merrimac to Sudbury Sts., to A. Cefalo, Boston, $6596. Noted June 20.

★**Ala., Sheffield**—City let contract building 6¾ mi. sanitary sewers, to Sullivan, Long & Haggerty, Bessemer. About $75,000. Work, when complete, practically completes sewerage system of city. Noted June 13.

★**O., Cleveland**—City let contract building sewer in East 138th St. from Woodland Rd. to St. Clair St. to N. Iaformaro, Cleveland, $16,000. Noted Apr. 4.

★**Ill., Chicago**—Bd. Local Impvts. let contract building sewers and installing manholes and catch basins as follows: To Ryan Co., 4500 West Division St., New England Ave. from Belmont to Diversey Sts., involving 2680 ft. 12-18 in. vitr. pipe, 21 brick manholes and 16 catch basins, $5133; Latrobe Ave. from Fullerton to Palmer Sts., 1375 ft. 10-15 in. vitr. pipe, 10 brick manholes and 10 catch basins, $2408; Nassau Ave. from Nagle to Ravenswood Sts., 2100 ft. 12-18 in. vitr. pipe, 15 brick manholes and 24 catch basins, $4531; G. Pontarelli, Chicago, Gramville, Thome and Highland Aves., Claremont and Irving Sts., Oakley Blvd. and alley south of Devan Ave., involving 1700 ft. 2½-3½ ft. brick sewer, 9198 ft. 12-22 in. tile, 67 brick manholes and 109 catch basins, $31,422; American Sewer & Drain Constr. Co., 2816 West Washtenaw Ave., Norwood St. from Bway. to Glenwood St., involving 1300 ft. 12-18 in. vitr. pipe, 11 brick manholes, $3801; A. Mancini, Chicago, Montrose Ave. from two points east of Clarendon Ave., involving 460 ft. 12 in. vitr. pipe, and 4 brick manholes, $1063; Di Vito & Till, Chicago, West 21st St. from Kostner to Kilbourn Sts., involving 1730 ft. 12-18 in. vitr. pipe, 13 manholes and 8 catch basins, $4146. Noted June 6.

★**Ill., Chicago**—Trustees Sanitary Dist., 910 South Michigan Ave., let contract building sewage pumping station to T. J. Forschner Contg. Co., West Pullman, $724,000 on work under Div. A, except item 18, Sanitary Dist. will pay half cost of work in excess of this amount up to $905,278, contractor to credit Dist. with half difference between $724,000 and actual cost in case it is less than this figure; contractor to furnish 6 pumps in Div B, $254,300 and 72 in. pump, $46,000 (this pump optional with Dist.) 8 motors in Div. C, $120,000; switchboard,, etc., Div. D, $49,495. Noted June 20.

Wis., Racine—Bd. Pub. Wks. received low bids laying sewers in Grove Ave., involving 1770 ft. 72 in. 662 ft. 36 in., 330 ft. 18 in. and 1678 ft. 15 in. sewer pipe and 37 manholes. and 65 catch basins, from E. R. Harding Co., 400 Robinson Bldg., $94 658; Fgan & Co., $99,508; P. B. Johnson, $99,919. Noted June 13.

Alta., Edmonton—City received only bid building portion North Edmonton sewer extension, from Brown & Hargraves, Edmonton. Noted May 30.

BRIDGES

Proposed Work

S. C., Columbia — See "Streets & Roads."

Fla., Clearwater—Pinellas Co. plans to issue $100,000 bonds to build bridge connecting Long Key with mainland.

Mich., Niles—City soon lets contract building concrete arch bridge over St. Joseph River. About $75,000. C. W. Cole, 525 J. M. S. Bldg., South Bend, Ind., engr.

Wnsconsin—See "Streets & Roads."

Mont., Butte—See "Streets & Roads."

Mont., Harlowton—See "Streets & Roads."

Mo., Independence—Comrs. Jackson Co. soon lets contract building Hostetter bridge, 16 ft. rein.-con. span, southeast of Atherton. Work involves 135 yd. rein.-con., 8700 lb. structural steel, 1200 yd. earth embankment and 360 yd. riprap. O. C. Sheley, co. engr.

Cal., San Jose—Bd. Supervs. Santa Clara Co. having plans prepared building rein.-con. bridge over Alamitos Creek on Alamitos Rd.

Ont., Ottawa—City plans to build Dundas St. bridge, concrete. About $22,000.

Ont., Peterboro—Peterboro Co. soon lets contract building three 30 ft. concrete bridges. Bowman & Connor, 31 Queen St., W., Toronto, engrs.

BIDS DESIRED

N. Y., Chittenango—Until July 1, by E. Duffey, comr. State Highway Dept., 55 Lancaster St., Albany, building Chittenango Creek bridge, Sullivan Twp., Madison Co. Former bids rejected; adv. in this issue. Noted June 20.

W. Va., Clarksburg—Until July 24, by Harrison Co., building 9 concrete bridges. J. R. Wilson, Co. engr. Certified check of $100, must accompany bid for each bridge.

W. Va., Middlebourne—Until July 10, by J. E. Smith, clk. Tyler Co., building one 55 ft. rein.-con. arch bridge over Sugar Creek, Mead Dist., one 60 ft. rein.-con. arch bridge over Elk Fork Creek, Ellsworth Dist. and 1 rein.-con. arch bridge consisting of two 65 ft. span over Middle Island Creek, Centreville Dist. near Deep Valley.

S. D., Hot Springs—Until July 2 by Fall River Co. building steel and concrete bridges. W. J. Smith, aud.

Mont., Libby—See "Streets & Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**Vt., Richford**—State let contract building rein.-con. bridge with two 67 ft. arches between here and Sutton, Que., to W. E. Poulin, Merieville, Que. About $24,825. Cost will be borne by State, Richford Twp. and Province of Quebec.

★**Pa., Harrisburg**—Central Iron & Steel Co., South Front St., will build 3 steel span bridge 164 ft. long, 18 ft. wide, on concrete piers over Paxton Creek, Daughpin Co., by day labor. About $25,000. Work involves 1000 cu.yd. concrete, 100 ton steel and 5000 lin.ft. wooden piling.

★**Pa., Wilkes-Barre**—Luzerne Co. let contract building rein.-con. slab highway bridges as follow: To G. W. Rockwell, Nanticoke, 9 bridges, in Hollenback, Dorrance, Lake, Fairmont and Black Creek Twps., $6550; M. J. Malloy, Sugar Notch, 3 bridges in Wright and Kingston Twps., $3260; E. W. Connelly, Wyoming, 3 bridges in Kingston and Dallas Twps., $2683; Boyle Constr. Co., Pearl St., 1 bridge in Wright Twp., $1170; Prod. Sales Co., Coal Ex. Bldg., steel for bridges, $587. Total cost, $14,250. Noted June 6.

★**Mich., Bangor**—Town let contract improving Indiantown Bridge on Euclid Ave., to H. Stewart, 418 Bearinger St., Saginaw. About $10,000.

★**Ill., Blue Island**—Trustees Sanitary Dist., Chicago, let contract building steel railroad bridges over Calumet-Sag channel, to Strobel Steel Constr. Co., 50 West Jackson St., Chicago, $20,470. Sanitary Dist. will furnish all material. Noted June 20.

***Ia., Elkader**—Clayton Co. let contract building one 160 ft. high truss or rein.-con. bridge at Mederville, one 20 ft. concrete slab bridge, 2 rein-con. culverts, etc., to F. E. Marsh & Co., Jefferson, $16,783 and C. H. Williamson, Elkader, $2614. Noted May 30.

★**Mo., Tipton Ford**—Newton Co. let contract building three 50 ft. span concrete bridge, 388 ft. long, 20 ft. wide, over Shoal Creek, here, to Concrete Steel & Constr. Co., Joplin, $15,800. Work involves 238 ft. earth approach and fill.

★**Tex., Georgetown** — See "Streets & Roads."

★**Okla., Ada**—Comrs. Pontotoc County (Ada) and Seminole Co. (Wenoka), let contract building concrete, low water bridge 20 ft. spans on 20 ft. piling, over South Canadian River between here and Konawa, to Kansas City Bridge Co., 510 Orear-Leslie Bldg., Kansas City, Mo., $35,541. Noted May 2.

★**Idaho, Twin Falls**—Twin Falls Co. let contract building 608 ft steel bridge near Hansen, to Midland Bridge Co., 504 Ry. Ex. Bldg., Kansas City, Mo. About $92,850.

★**Wash., Chehalis**—State Highway Comn., Olympia, let contract building 270 ft. steel span bridge over Cowlitz River on National Park highway, Lewis Co., to C. C. Huber, Seattle. About $21,980.

★**Wash., Colfax**—Whitman Co. let contract building Parvin bridge on Improved Rd. No. 2, to H. C. Mallott, 6526 17th Ave., N. E., Seattle. About $13,995. Contract subject to approval of Capital Issues Com.

★**Wash., North Bend**—Comrs. King Co. let contract building concrete and steel bridge with wooden piling across South Fork of Snoqualmie River, 437 ft. long, 20-50 ft. wide, involving 220 cu. yd. concrete, 208 tons steel and 4000 lin. ft. piling, to C. C. Snyder, Pacific Blk., Seattle, $13,132.

★**Wash., Whitman**—Colfax Co. let contract building bridges in connection with road work, here, to Mitchell Bros., Paulsen Bldg., Spokane. About $13,000. Contract conditional upon approval of Bond Issues Com. See "Streets & Roads."

★**Cal., San Jose**—City let contract building rein.-con. bridge over Coyote Creek at Santa Clara St., to Eaton & Smith, 407 11th St., San Francisco. About $55,000.

***Cal., Santa Ana**—City let contract building rein.-con. bridges over Santiago Creek at Main and Flower Sts., to C. McNeill and Wells & Bressler,, Santa Ana, $46,813 and $11,275 respectively. Noted June 13.

★**Cal., Woodland**—Yolo Co. rejected bid building 115 ft. concrete bridge over Buckeye Creek. Work to be done by day labor. Noted May 30.

★**Ont., Burford**—Burford Twp. let contract building 2 rein.-con. bridges to Stratford Bridge & Iron Co., Ltd., 91 Erie St., Stratford. Noted Apr. 18.

STRUCTURAL STEEL WORK

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**Pa., Harrisburg**—See "Bridges."
★**Ill., Blue Island**—See "Bridges."
★**Wash., Chehalis**—See "Bridges."
★**Wash., North Bend**—See "Bridges."

REINFORCED CONCRETE

Proposed Work

Neb., Broken Bow—See "Industrial Works."
Cal., San Francisco—See "Miscellaneous."
Ont., Fenelon Falls—See "Industrial Works."
Ont., Ottawa—See "Bridges."
Ont., Peterboro—See "Bridges."

BIDS DESIRED

W. Va., Clarksburg—See "Bridges."
Mont., Livingston—See "Water Works."
Utah, Spanish Fork—See "Water Works."
Wash., Yoman—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**La., Shreveport**—See "Industrial Works."
★**Ia., Elkader**—See "Bridges."
★**Neb., Omaha**—See "Industrial Works."
★**Wash., Olympia**—See "Buildings."
Cal., San Jose—See "Bridges."
★**Ont., Burford**—See "Bridges."

STREETS AND ROADS

Proposed Work

N. J., Carneys Point—Bd. Freeholders Salem Co., (Salem), plans to build 1 mi. concrete highway, from entrance to plant No. 2 of Du Pont Powder Co., to lower canal bridge.

N. J., Hackensack—State Highway Comn., Trenton, allotted $25,000 to Bergen Co. for building and improving roads. R. P. Clave, co. engr.

N. J., Hoboken—City having plans prepared for repairing 4th, 7th and 14th Sts. J. D. Whittemore, city engr.

N. J., Jersey City—City plans to repair ½ mi. Grand St. from Junction to Pacific Ave., granite block. C. Van Keuren, City Hall, engr.

N. J., Newton—Sussex Co. soon receives bids building 6 mi. Rose Corner Sussex Rd., 18 ft. wide, Tarvia bound screenings on heavy stone. State Highway Comr. has approved project and will appropriate 50% of cost.

N. J., Trenton—City plans to repave ¾ mi. Greenwood Ave., 22 ft. wide. About $25,000. J. R. Fell, 134 North Clinton Ave., city engr.

Va., Graham—City plans to improve 2 mi. Graham St., from Midway to West Graham. About $10,000.

W. Va., Moundsville—Marshall Co., plans to repave and regrade 1.3 mi. Narrow Rd., also widen same in various places. About $50,000. S. H. Bonar, Engr.

South Carolina — Sanitary Drainage Comn., Columbia, approved following road project: 2.12 mi., Richland Co., $51,679; 2.84 mi. asphaltic and 12.06 mi. concrete and top soil roads, Spartanburg Co., $121,717; 4.9 mi. concrete and top soil road, Greenville Co., $35,540; 3 mi. concrete road, York Co., $36,758; 2.14 mi. gravel road, Chesterfield Co., $13,565; 3.51 mi. earth road and bridge, Marion Co., $54,679; 20.42 mi. sand clay road, Horry Co., $44,574; 20.17 mi. sand clay road, Bamberg Co., $26,129; 5.63 mi. top soil and gravel road, Newberry Co., $16,179; 22.34 mi. gravel and granite road, Lancaster Co., $40,297; 9.46 mi. top soil road, Chester Co., $53,769; 3.73 mi. concrete road, Charleston Co., $135,764; 14 mi. road and Lockhart bridge, Union and Chester Counties, $44,868. Cost to be borne by Government and counties. Noted Mar. 28.

Miss., Hattiesburg—City plans to resurface Main St. from Gordon's Creek to Bay St. and Bay St. from Main St. to Hall Ave., 1 in. binder and 1 in. asphalt wearing surface; repairing pavement on Mobile St. from Pine to Front Sts. and Pine St. from Mobile St. to Gulf & Ship Island R. R., 3-in. vitr. brick. A. Fairley, comn. clk.

O., Akron—Comrs. Summit Co. soon lets contract improving 2½ mi. Springfield Rd., 16 ft. wide, bituminous concrete and asphalt, or brick. Noted Apr. 18.

O., Rittman—Village election Aug. 13, to vote on $30,000 bonds to pave Salt St., from Main St. to east corporation limits. W. Hickin, city clk.

Ill., Chicago—City soon lets contract building streets and alleys as follows:

Alley between Bryn Mawr, Catalpa, Bway. and Magnolia Sts., involving 1288 ft. concrete curb, 385 cu.yd. grading, 1000 sq.yd. vitr. brick pavement on 6 in. cement base, cost, $3865.

Alley between Darwin, Edgewood, Albany and Kedzie Sts., 100 cu.yd. grading, 250 sq.yd. 7 in. concrete pavement, $725.

Alley between Diversey, Schubert, Mozart and Francisco Sts., 280 cu.yd. grading, 986 sq.yd. 7 in. concrete pavement, 260 ft. 10 in. sewer tile, 1 catch basin, 1 manhold, $3153.

Alley between Van Biren, Congress, Hamlin and Springfield Sts., 389 cu.yd. grading, 1190 sq.yd. 7 in. concrete pavement, $2620.

Alley between Harrison, Flournoy, Leavitt and Hoyne Sts., 210 cu.yd. grading, 1040 sq.yd. 7 in. concrete pavement, $2343.

Alley between Pierce, Le Moyne, Spaulding and Homan Sts., 1201 ft. concrete curb, 350 cu.yd. grading, 935 sq.yd. vitr. brick pavement on 6 in. concrete base, $3281.

Alley between Carroll, Fulton, Elizabeth and Ada Sts., 903 ft. concrete curb, 400 cu.yd. grading, 803 sq.yd. vitr.brick pavement, on 6 in. concrete base, $3154.

Alley between Maxwell and Liberty Sts. from Union Ave. to point east, 400 ft. concrete curb, 100 cu.yd. grading, 200 sq.yd. vitr. brick pavement on 6 in. concrete base. $800.

Alley west of Jefferson St. from Maxwell to Liberty Sts., 360 ft. concrete curb, 80 cu.yd. grading, 160 sq.yd. vitr. brick pavement on 6 in. concrete base, $6650.

Alley between Arthington, Taylor, Francisco and Sacramento Sts., 266 cu.yd. grading, 1040 sq.yd. 7 in. concrete pavement. $2450.

Volume 80 June 27, 1918 *Number 26*

Engineering News-Record

A CONSOLIDATION OF ENGINEERING NEWS AND ENGINEERING RECORD

E. J. MEHREN, *Editor*
CHARLES WHITING BAKER, *Consulting Editor*

Extension to Superior Ore Dock Built of Concrete 1213
NORTHERN PACIFIC'S new structure has heavy frame resting on wood piles and sand-filled timber cribs—Has detail differences from similar older design.
Engineering News-Record, June 27, 1918. 3 cols. Ill.

Good Handling Equipment Speeds Ore Dock Construction 1214
PILE DRIVERS MAKE RECORD—Concrete readily placed by floating plant—Standardized forms swing from movable derricks.
Engineering News-Record, June 27, 1918. 5 cols. Ill.

Government Steel Requisitions Are on Safe Side 1217
RUSSIA THE KEY to post-war trade, publisher of "Iron Age" tells meeting of manufacturers and publishers held in Chicago.
Engineering News-Record, June 27, 1918. 5½ cols.

Protecting the Panama Lock Valves Against Electrolysis 1219
BY R. H. WHITEHEAD.
CORROSION BETWEEN opposing metals soon set in, so protective coatings were applied and wood separators used.
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Compact Concreting Plant Builds St. Paul Station 1221
BINS ARE FED by belt conveyor and charge mixer through measuring hopper—Concrete spouted from tower.
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Practice in Assessing Pavement Costs Determined 1223
QUESTIONNAIRE SENT to numerous cities by the New York State Conference of Mayors brought divergent answers.
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Diagram Helps in Laying out Railroad Curves from Long Chords 1224
BY H. N. GAHAN.
Engineering News-Record, June 27, 1918. 1 col. Ill.

Operation of Grand River Roller Dam Proves Satisfactory 1225
BY S. O. HARPER.
OBSERVATIONS on behavior of largest of the three dams of its type in country, after one year's service.
Engineering News-Record, June 27, 1918. 4 cols. Ill.

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Suggested Reforms in Floor-Load Requirements of City Building Laws 1227
BY R. FLEMING.
MANY CODES specify excessive live loads for office buildings, dwellings and hotels—Weight of crowds overestimated—Garages should provide for loaded trucks—Rational live-load reduction.
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WATER of the Colorado River at El Centro, California, after a 75-mile journey in irrigation canals, is clarified without chemical treatment.
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Land Computations for Railway Valuation 1232
BY H. H. CARTWRIGHT.
Engineering News-Record, June 27, 1918. ¼ col.

Forecasting Sewage Discharge at Toledo Under Dry-Weather Conditions 1233
BY WATSON G. HARMON.
UNIT QUANTITIES for 1960 based on estimating present discharge, correcting present estimates by present discharge, and applying corrected estimates to future conditions.
Engineering News-Record, June 27, 1918. 5¼ cols. Ill.

Increase Fire Pump Efficiency 1235
Engineering News-Record, June 27, 1918. ¾ col.

Forcing Culverts Under Roads With Hydraulic Jacks 1236
PIPES up to 4 ft. diameter of corrugated iron or concrete installed at costs lower than by open-cut method.
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Architects Must Put Utility Before Aesthetics 1238
C. H. BLACKALL tells profession members must organize firms able to administer work and handle concrete problems.
Engineering News-Record, June 27, 1918. 5½ cols.

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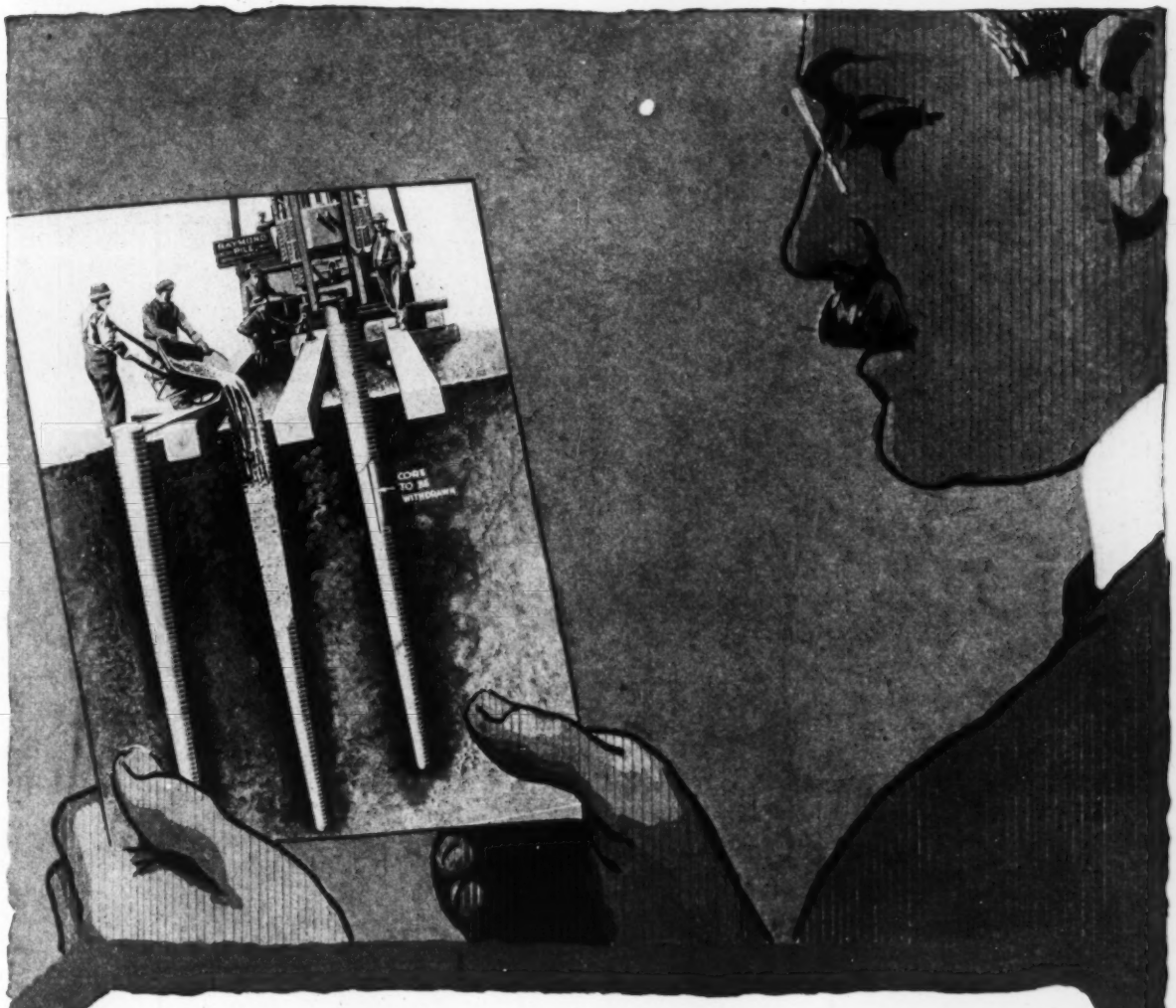

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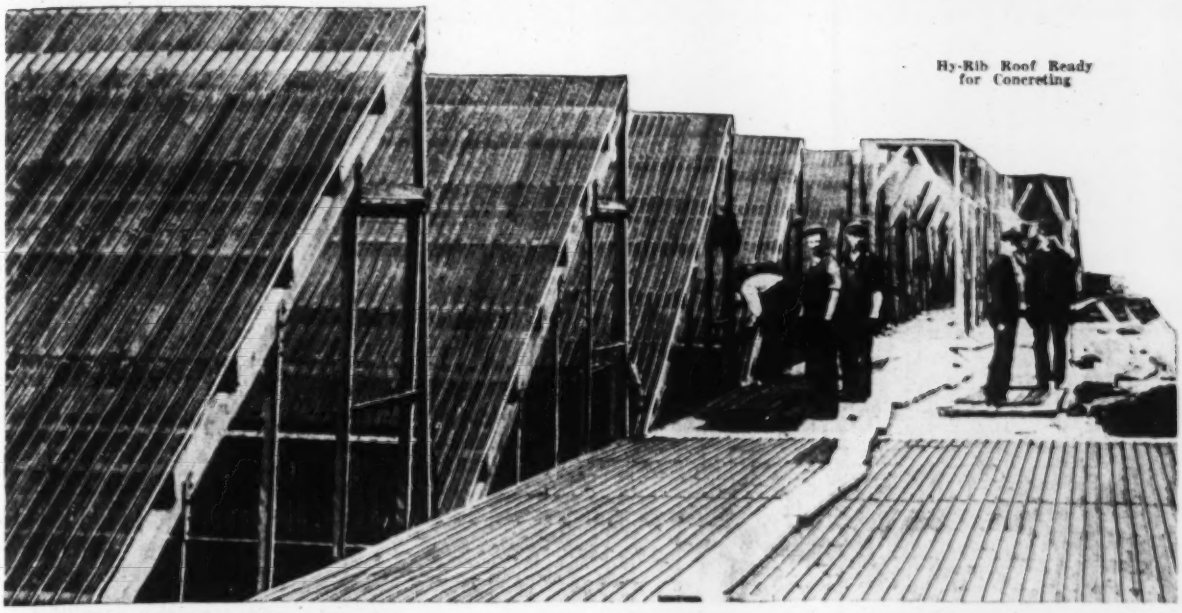

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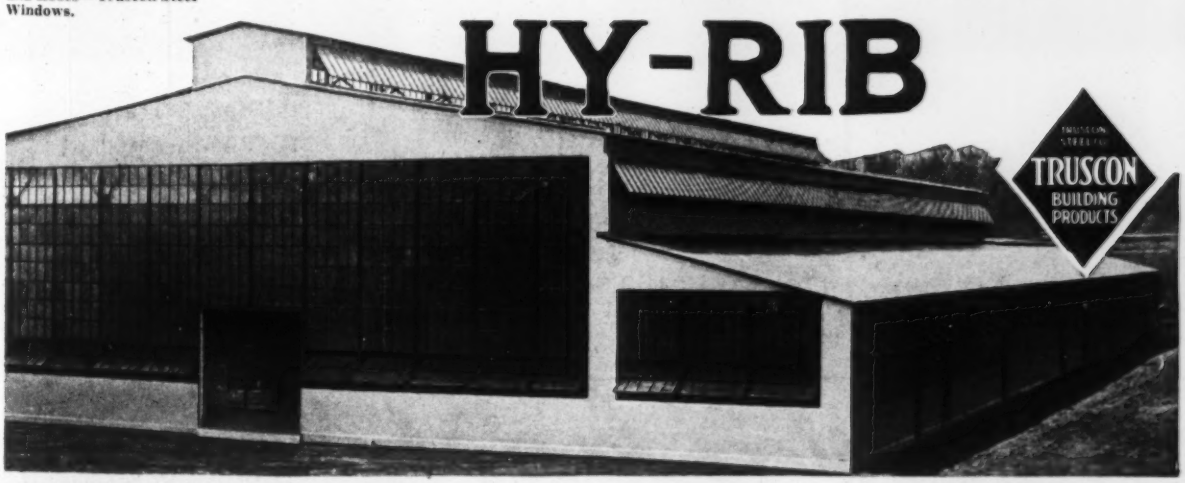

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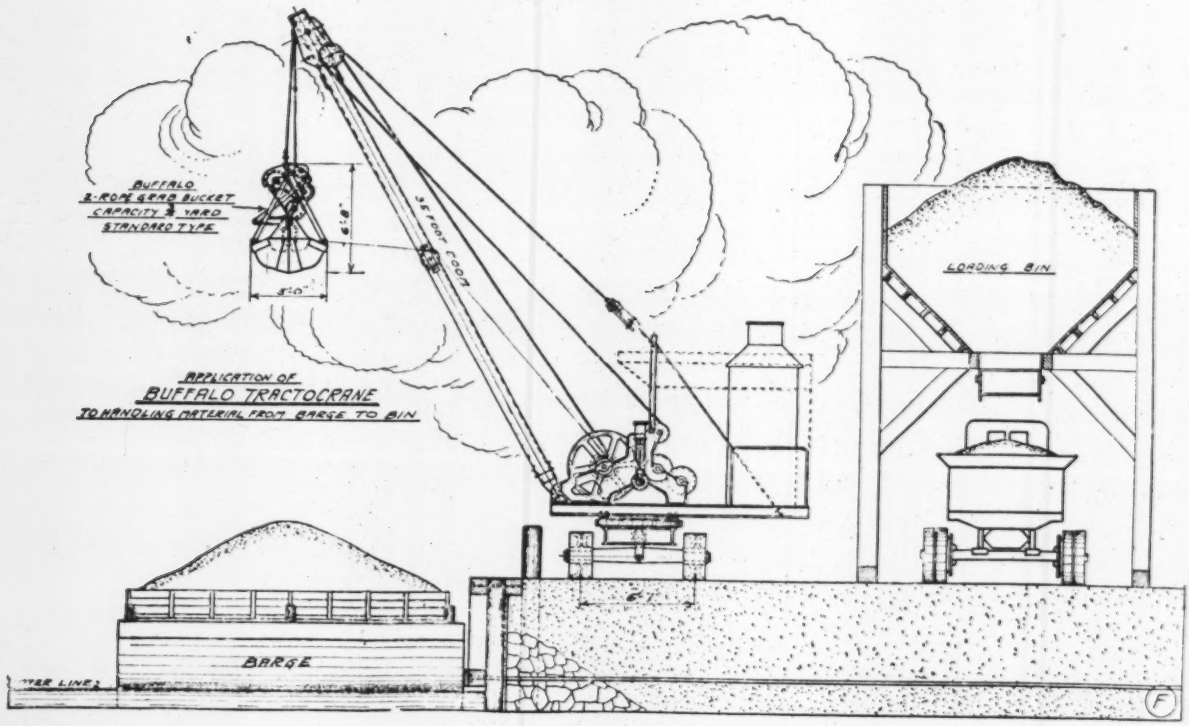

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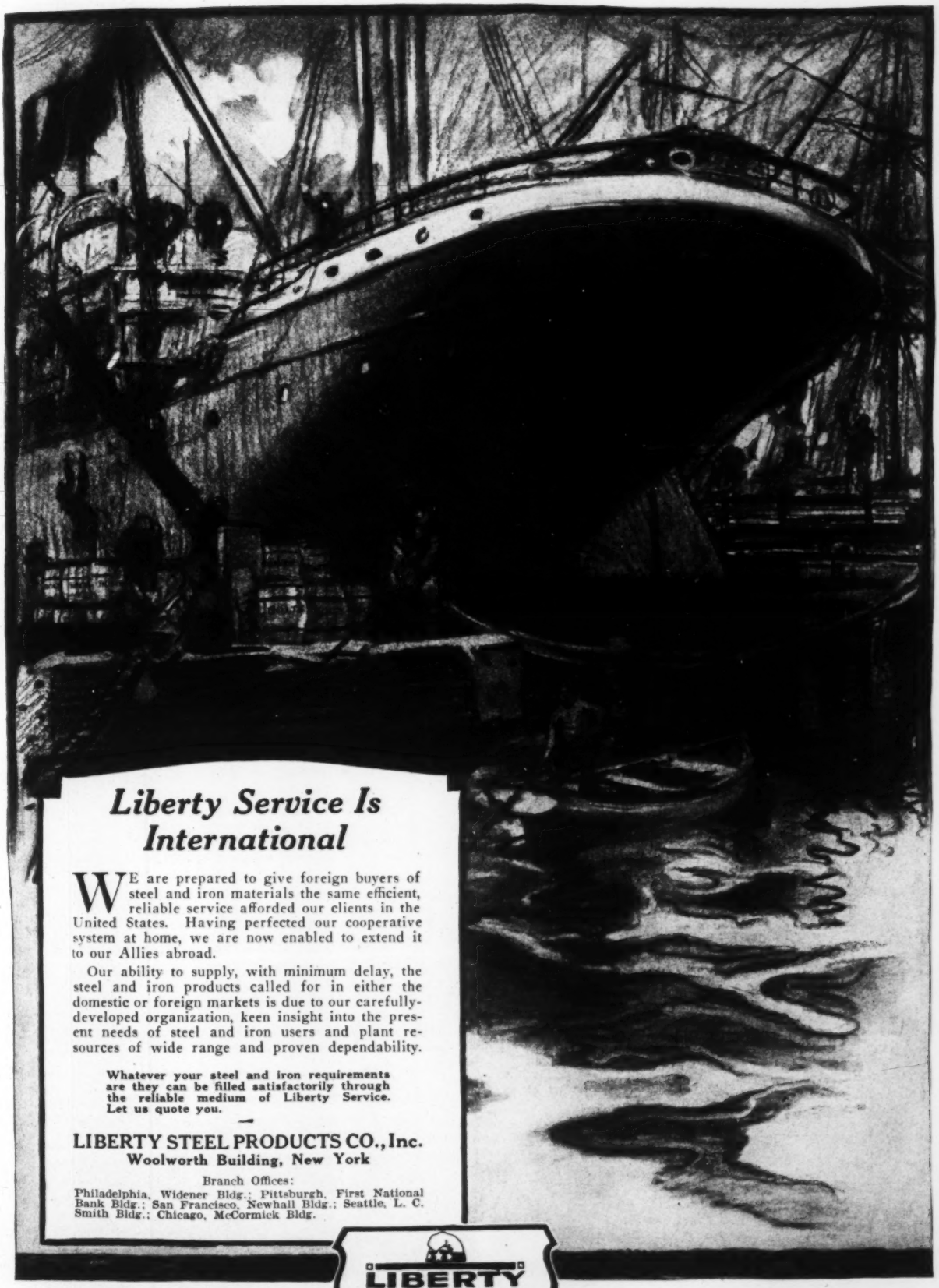

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One night the timekeeper got orders by 'phone to dish up fancy eats next noon. The Big Chief and the General Contractor were coming from Chicago.

So the timekeeper, who was about fed up on codfish and stewed apples himself, told the cook to go the limit.

The cook did.

Next day the shovel gang, the dinkey crews, the muckers and the whole outfit sat down to a feed of rare roast beef, brown potatoes, canned peas, canned oysters, sliced pineapple, pie, cake and tobasco sauce that made their eyes pop out.

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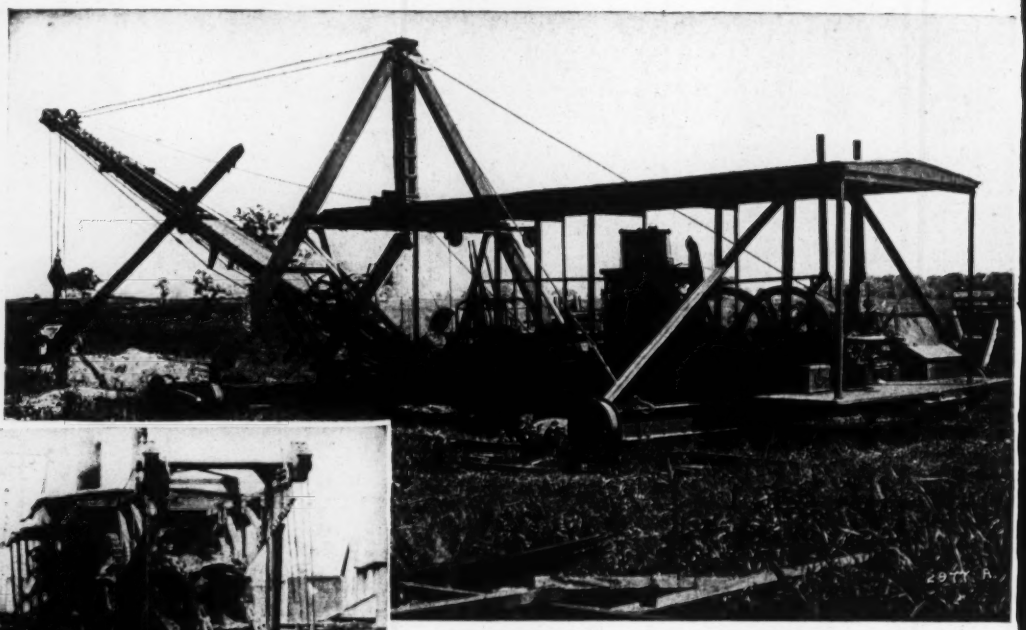
AUSTIN



Austin Trench Excavator

The machine for hard digging. Heavy, rugged, all-steel construction guarantees long life and few repairs—uninterrupted work and more of it.

Ability to cut various widths and depths of trench without affecting yardage of day's run is an important feature.

Self-cleaning buckets give relief from the usual troubles encountered in adhesive soils.

Austins have working ability with durability.

Ask for Catalog 103-A.

Austin Improved Land Dipper Dredge

For digging open ditches for drainage, irrigation, road building and cutting trenches for large tile drains.

Operation requires two men—one for the engine and one for the dipper.

Power consists of a 4-cycle type engine using either gasoline, kerosene or distillate—ample capacity for operating all motions simultaneously or independently.

Traction—by its own power—travels without stopping work. The weight being distributed over a large area, enables it to travel easily over swampy or uneven ground. Track is furnished complete with ties, so arranged that a quick and simple splice can be made.

Capacity—will dig ditches up to 28 feet wide at top and 14 feet deep in any kind of soil.

Portable without dismantling machinery.

Send for Bulletin "DD"

F. C. AUSTIN COMPANY, Inc.

Main Office: Railway Exchange, Chicago. **New York Office: 30 Church St.**

Use 16-Ft. Sheets

for Speed, Efficiency, Economy

Two men, unskilled, can quickly and accurately place these big easily handled sheets.

Each sheet when placed covers an area, not merely a line—an area of many square feet.

Steelcrete

TRADE MARK REGISTERED

Expanded Metal

is the reinforcement sheet for today. Its labor-saving features are of vital value at this time.

When pouring the concrete, the stiff, rigid "Steelcrete" sheets retain their place securely in the forms. Men walk on "Steelcrete" with no danger of displacing it.

"Steelcrete" in 16-ft. sheets enables you to cut your time and costs. It makes every job progress quicker, smoother, better.

"Steelcrete' gives real speed, efficiency, economy.

For all work that is in accord with our Government's war program, "Steelcrete" is readily obtainable.

The "Steelcrete" Handbook contains practical information for every Engineer and Contractor. Just write for it today.

The Consolidated Expanded Metal Companies

BRADDOCK, PA.

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NEW YORK,
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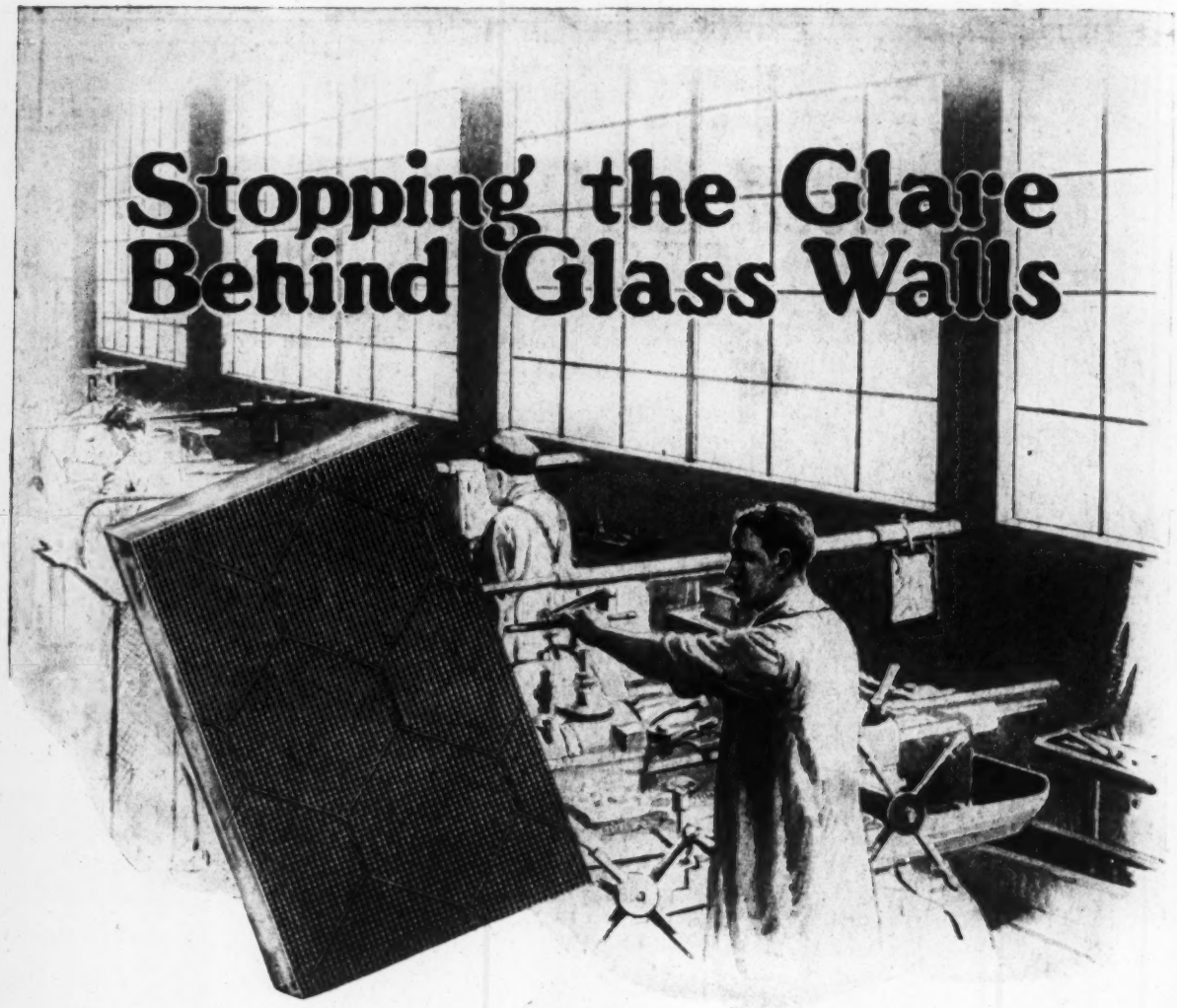
SAN FRANCISCO,
Holloway Expanded Metal Co.

TORONTO—Baines & Peckover

Stopping the Glare Behind Glass Walls



On the sunny side of a big "daylighted" factory, on a bright day, is ordinarily a blinding place to work. Whether the men place temporary sun shades to relieve the eye strain, or put on dark glasses, shop production slackens—the work drags—there is economic waste.

The scientific way to correct this trouble is to forestall it by specifying "FACTROLITE" for glass in sidewalls, monitors and skylights.

"FACTROLITE" diffuses the sun's rays so that you can look Old Sol right in the eye behind a "FACTROLIGHTED" sash.

Then, too, "FACTROLITE" checks *reflection* from the outer side of the panes. It gathers in rays from a wider angle of incidence than ordinary glass and refracts them into a diffused, shadowless daylight indoors.

"FACTROLITE" is the result of years of research work. It is offered to the engineering public as the latest development for *daylighting* factories and offices. Made in both plain and wire glass. A free sample sent to engineers. *Mark and mail the coupon.*

Mississippi Wire Glass Company
218 Fifth Avenue
New York

Chicago, Illinois
St. Louis, Missouri

Mississippi Wire Glass Co.,
218 Fifth Ave., New York.
Gentlemen:
Send me a Catalog and Paper Weight as advertised in Engineering News-Record. It is understood this does not obligate me in any way.
Name .....
Address .....
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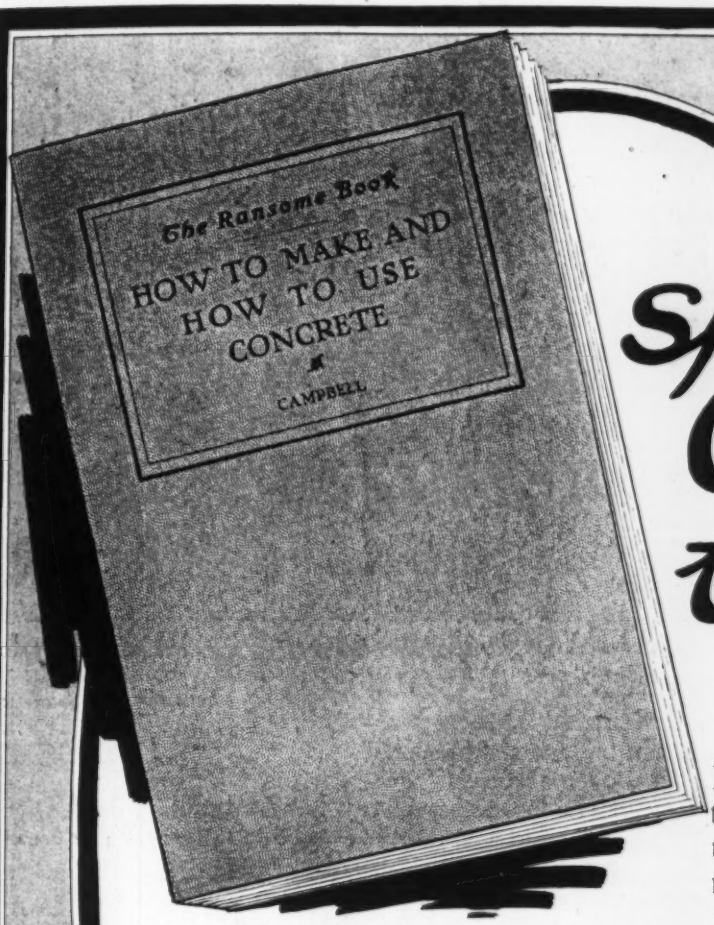

A special Offer to you

If you are a contractor, superintendent or engineer, or are otherwise directly concerned with making and using concrete we will send you a free copy (established price $1.00) if you will fill out complete and mail the following coupon.

The Ransome Book, prepared by H. Colin Campbell, C.E., E.M. Director, Editorial Bureau, Portland Cement Association, contains a wealth of valuable information, tables, drawings, etc. Bound in flexible cloth.

RANSOME CONCRETE MACHINERY CO.

Main Office and Works:
1750 Second Street, Dunellen, N. J.

Branch Offices
Boston, New York, Chicago, San Francisco, Philadelphia, Atlanta.
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Manufacturers of
Mixers, Pavers, Hoists, Hoisting Buckets, Bins, Spouting Plants, Carts, Cars, Barrows, Chutes, etc.

31-7

Ransome Concrete Machinery Co., Dunellen, N. J.

In consideration of my giving you the following information please send without expense to me a copy of The Ransome Book on "How to Make and How to Use Concrete."

Name..... Title or Position.....

Concern..... Business.....

Street..... City and State.....

We do (not) use Mixers.

REPRODUCED FROM A CONTEMPORANEOUS WOOD-CUT

Fire broke out in De Koven Street on the evening of Oct. 8, 1871, spread to neighboring lumber yards and wooden houses and leaped the Chicago River to the business district. Area burned over 3½ square miles. Lives lost about 200, property loss $200,000,000.

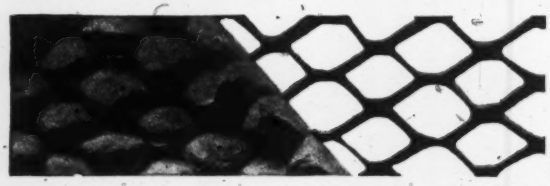
When the Widow O'Leary's Cow

kicked over the lantern in Chicago, back in 1871, there was plenty of fuel about, to start a conflagration and, as the fire continued to find fuel, it spread rapidly until even fire resistive construction could not entirely stop the flames. The loss was over two hundred million dollars.

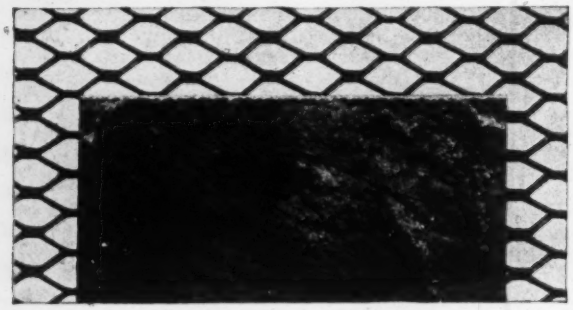
Since that time San Francisco, Salem, Baltimore, Atlanta, Paris, Tex., and hundreds of other fires have followed the same course—a small fire—no resistance—result, great fires, all resistance to which was futile.

The Best Insurance Against Fire

is fire resistive construction in the residence districts as well as in the more congested regions.



The Inside Key—Stucco or plaster is held firmly in place. The Metal Lath cannot warp or shrink and cause cracks or irregularities.



ROUGH CAST, STUCCO FINISH

This is one of the many pleasing surfaces that can be produced in stucco. These various surfaces, the use of tinted stucco and a variety of exterior detail make possible a wide variation in the appearance of a series of buildings of the same type and design.

Group construction for industrial housing or other purposes should always be substantially fire resistive. This can be accomplished very effectively by a fire resistive roof and

BERGER'S
Expanded Metal Lath

used as backing for stucco and plaster.

That this construction offers great fire resistance has been proven in many tests and in thousands of fires. At the same time it offers *greater permanence* and an *actual economy*.

The cost of paint and labor is soaring. *Stucco needs no paint.* Upkeep costs for the first ten years will show a margin in favor of stucco, later years roll up a big profit.

Wood construction cannot offer this fire resistance, permanence and low upkeep cost.

In any kind of construction in which Metal Lath is used you'll find our new Metal Lath Handbook of great value. **Address Dept. F-24.**

What's Behind Your Plaster

THE BERGER MFG. COMPANY, Canton, O.

BRANCHES: Boston, New York, Philadelphia, Chicago, St. Louis, Minneapolis, San Francisco

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Member Associated Metal Lath Manufacturers

BERGER

"Steel for Strength—Wood for Durability"

No. 15 of a Series of

Plain Talks to Municipal Engineers

on

MICHIGAN PIPE

Above-board Advertising

This Company does not advocate MICHIGAN Wood Pipe for every purpose. We are careful to analyze in detail the problems of our customers. If your problem will *not* be solved by wood pipe we will frankly advise you accordingly. If it is a direct pumping line, we recommend MICHIGAN Pipe where maximum pressure does not exceed 90 lb. per sq.in. and domestic pressure 40 lb. For gravity flow, we recommend MICHIGAN Pipe for working pressures up to 130 lb. per sq.in. But wherever you want a light-weight, low-cost pipe, easily transported, easily handled and quickly installed by green labor, we do recommend MICHIGAN Pipe unreservedly. We state—and our statements are based upon FACT—that this pipe will not diminish but rather *increase* in capacity—that it will preserve the purity of the water and that corrosion, frost and electrolysis will never affect it.

Send for the NEW Pipe Book

if you are interested in cutting down water main construction or renewal expenses in your municipality.

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Chicago.....900 Lytton Bldg. Cleveland.....919 American Trust Bldg. New York.....30 E. 42nd St.
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T. A. Morrison & Co., 204 St. James St., Montreal, Quebec, Canada.

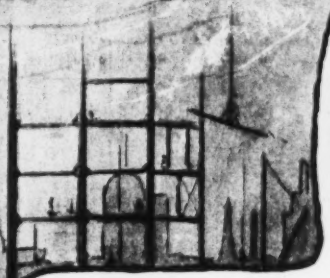
"MICHIGAN" Combination Steel and Wood PIPE

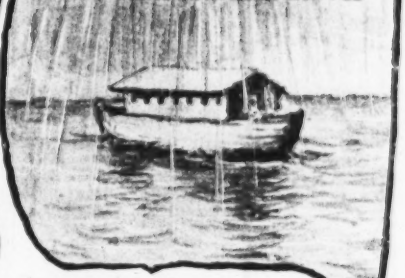
You know that-

STEEL IS STRONG

ASBESTOS IS INERT

ASPHALT IS WATERPROOF





Therefore when STEEL, ASBESTOS and ASPHALT are combined, as is done in Asbestos Protected Metal, you have a product with remarkable strength and durability

And apart from this very natural assumption, what has Asbestos Protected Metal proven in service?

It has proven that sulphurous gases, acid and alkali fumes and dampness (even salt water dampness) will not rust it.

It has proven superior to the weather's merciless and perpetual alternations—sunshine and storm, dryness and moisture, intense heat and intense cold.

It has proven itself a most effective fire-retardant. It has proven that it does not require painting.

APM is not only moderate in first cost, but it involves practically no maintenance or depreciation costs. It LASTS—because of materials naturally strong and protective. Furnished in standard gauges and sizes, red and black.

The man interested in enclosing a single, small factory building, or the man with the roofing and siding problems of a great industrial plant, will both find facts of interest in Bulletin 553.

Asprome Pittsburgh APM Company (First National Bank Building) U.S.A.

APM is used to cover this sea coast power plant.

2115

HEAVY WATERPROOFING ENVELOPE

ASBESTOS (on all sides)

ASPHALT (on all sides)

STEEL

APM

Pacific Gas and Electric Company
Oakland, California

87-A248

Cooperative Service to the Export Buyer

THE ALLIED CONSTRUCTION MACHINERY CORPORATION was formed by the American International Corporation and a group of non-competing American manufacturers of construction machinery.

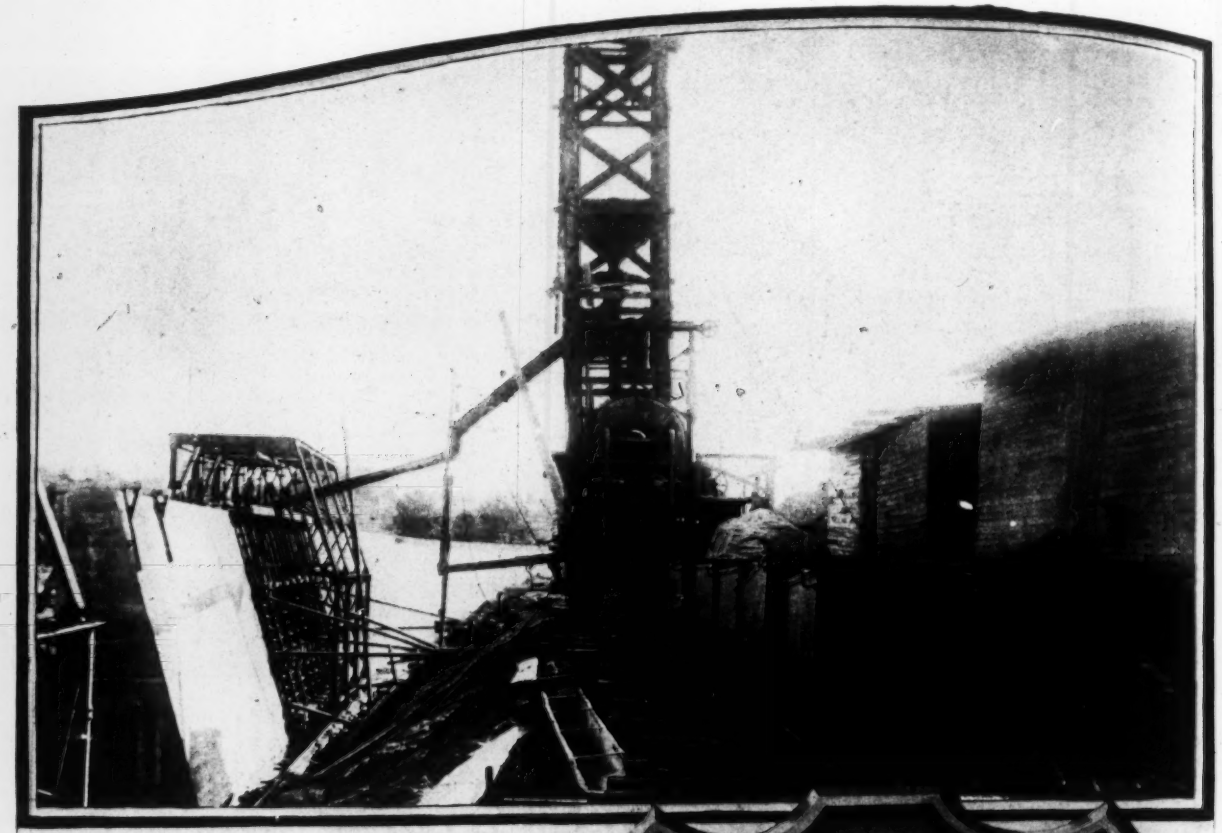
The buyer for export can secure from this single organization a complete line of contractors' plant and equipment—backed by undivided responsibility for shipments and guarantees.

The following manufacturers have joined this cooperative plan of serving the buyer for export to all countries outside of the United States and Canada:

The Lakewood Engineering Company, Cleveland, Ohio
The Thew Automatic Shovel Company, Lorain, Ohio
The Parsons Company, Newton, Iowa
The Hydraulic Pressed Steel Company, Cleveland, Ohio
(Concrete Form Department)
The Clyde Iron Works, Duluth, Minnesota
The C. H. & E. Manufacturing Company, Milwaukee, Wisconsin
Sterling Wheelbarrow Co., West Allis, Wisconsin
Barber-Greene Co., Aurora, Illinois

For France, Spain, Italy, Portugal, Belgium and their colonies: the West Indies and China:
The Western Wheeled Scraper Company, Aurora, Illinois
The Austin Manufacturing Company, Chicago, Illinois

ALLIED — ALLIED CONSTRUCTION MACHINERY CORPORATION — ALLIED
Under the management and direction of the AMERICAN INTERNATIONAL CORPORATION
120 Broadway New York, U.S.A.



LAKEWOOD
CONSTRUCTION PLANT

The Right Equipment

It was the privilege of Lakewood Engineers to work with the Ganley Construction Company in the selection of the necessary equipment for building the Canal Harbor on the Genesee River, at Rochester, New York.

For the most economical handling of the job, a No. 21 Lakewood Electric Driven Mixer, with extended loader, all mounted on a car, a Type "O" Unit Chute and several End Dump Cars were adopted.

Link up with Lakewood—
it pays

Link up with Lakewood

Lakewood Engineering Co., Cleveland

FACTORIES

LAKEWOOD GALION CHICAGO HEIGHTS WEST PARK MILWAUKEE ELYRIA

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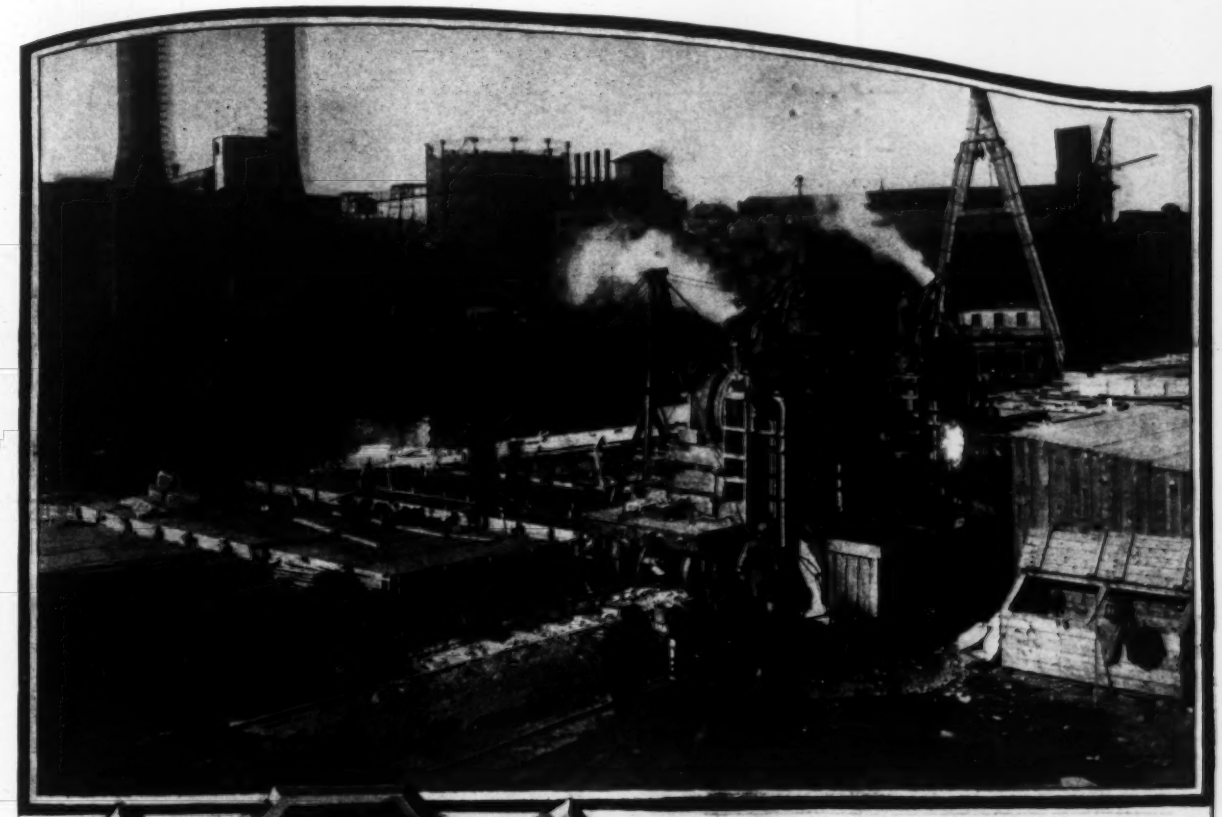

LAKEWOOD

CONSTRUCTION PLANT

Mixing Efficiency

Roy H. Beattie, Inc., of Fall River, Mass., secured the contract to pour these concrete piers for the Standard Oil Company, at Providence, R. I.

Investigation developed that two No. 14-S Lakewood-Milwaukee Mixers would handle the work satisfactorily. These Mixers were mounted on standard flat cars.

It is the function of Lakewood Engineers to assist contractors in the proper utilization of their present equipment or in the selection of newplant.

Link up with Lakewood—
it pays

Link up with Lakewood

Lakewood Engineering Co., Cleveland

FACTORIES

LAKEWOOD GALION CHICAGO HEIGHTS WEST PARK MILWAUKEE ELYRIA

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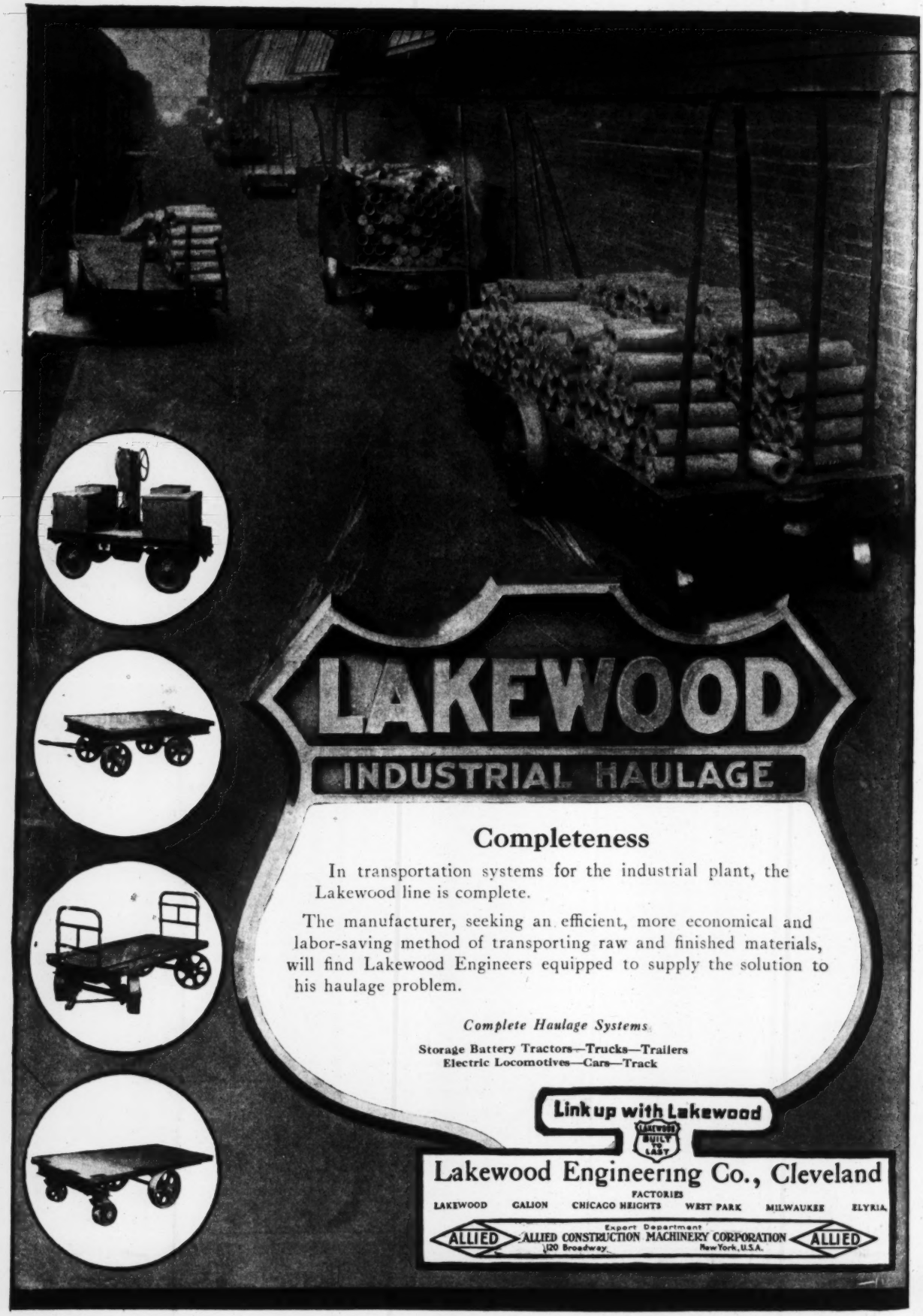

LAKEWOOD
INDUSTRIAL HAULAGE

Completeness

In transportation systems for the industrial plant, the Lakewood line is complete.

The manufacturer, seeking an efficient, more economical and labor-saving method of transporting raw and finished materials, will find Lakewood Engineers equipped to supply the solution to his haulage problem.

Complete Haulage Systems

Storage Battery Tractors—Trucks—Trailers
Electric Locomotives—Cars—Track

Link up with Lakewood

Lakewood Engineering Co., Cleveland

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LAKEWOOD
CONSTRUCTION PLANT
Completeness
The thing that forcibly strikes the contractor who decides to "Link up with Lakewood" is the thoroughly complete service offered.
He finds that he is not compelled to purchase track at one place, locomotives at another and cars at a third—with the almost inevitable confusion resulting from differences in standards and sizes.
Lakewood offers a complete line of construction plant, including Portable Track, a wide variety of Cars and Heavy-Duty Storage Battery Locomotives.
Link up with Lakewood—
it pays
Link up with Lakewood
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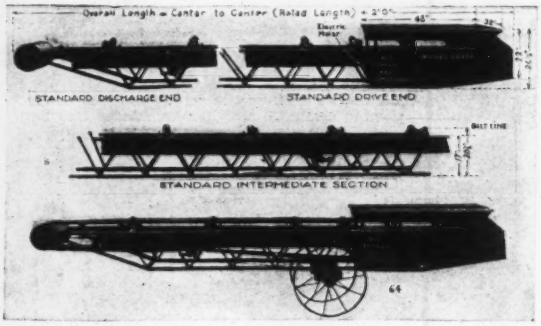
Quickest, Most Economical Way to Load or Unload Cars

Men can do just so much and no more. In addition, labor is expensive—and now the demand is to use our human power only in the most essential work.

B-G Portable Conveyors meet this demand squarely. In loading or unloading cars, they produce better results than five men—in less time and cost. They effect a 50 per cent. saving in cost for every ton of material conveyed, and eliminate 60 per cent. of the labor. For two men can handle the conveyor—while three are released for more vital work.



Standard Sectional Units

We manufacture several styles of B-G Portable Conveyors. Frames are rigid and capable of operating at various angles. These can be mounted on any of our standard trucks, and be moved wherever desired. Frame may be suspended from overhead trolley when truck cannot be used.

B-G Portable Conveyors are being used for many classes of work for which no other equipment can be adapted, because of their light weight, compactness, large capacity and low maintenance cost.

Quick deliveries are a feature of B-G Service.

Consult B-G Engineers for further details.

BARBER-GREENE CO.,

560 West Park Avenue
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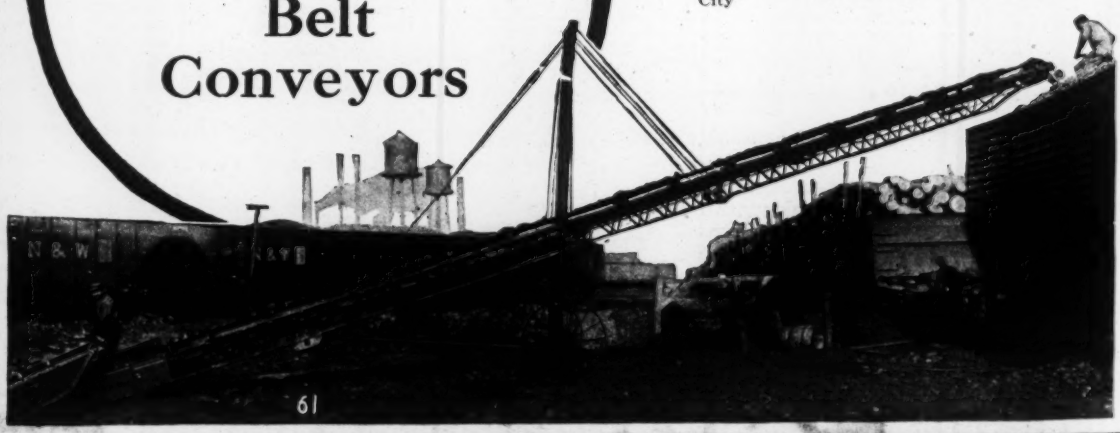
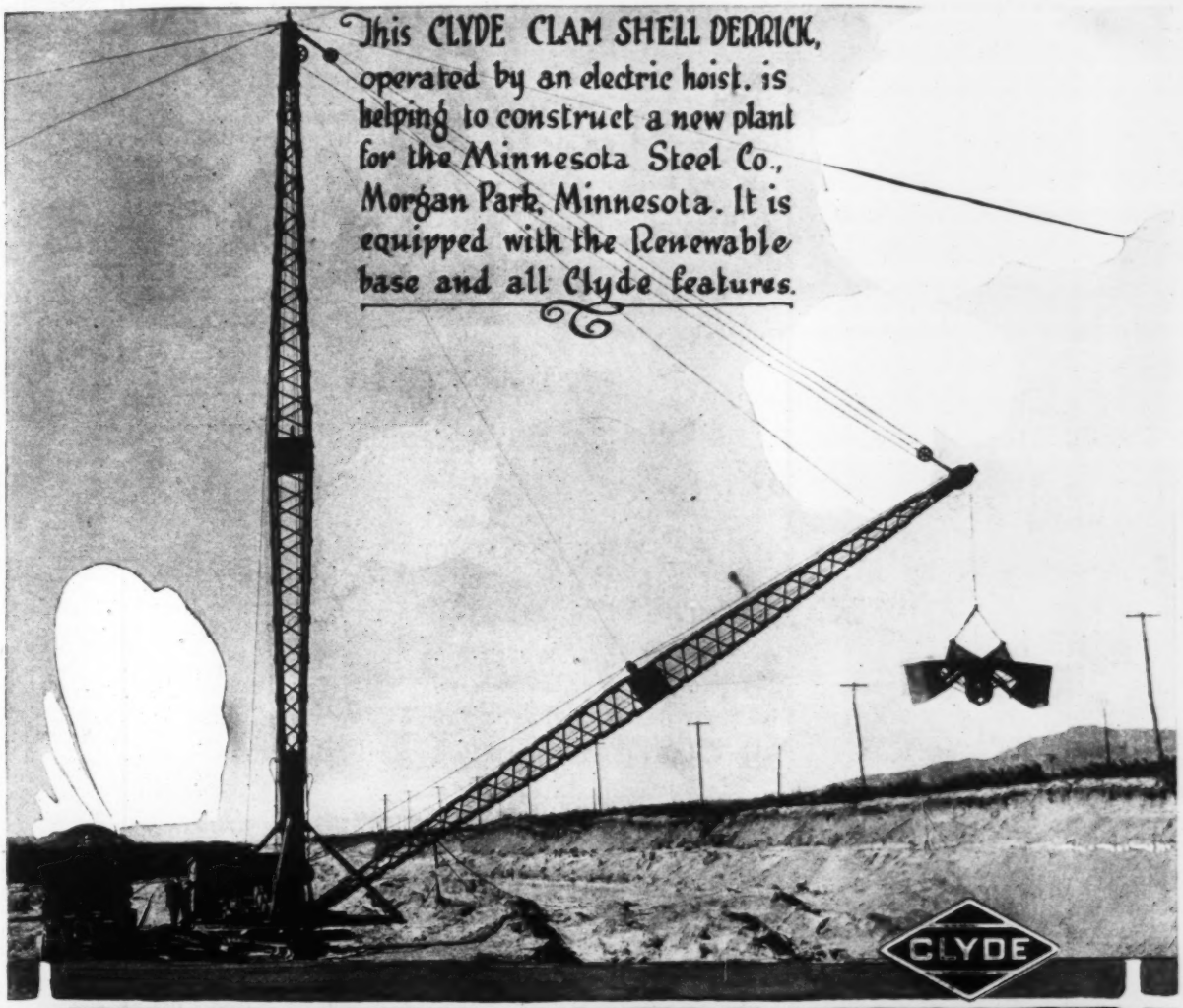
B-G
Portable Belt Conveyors




This CLYDE CLAM SHELL DERRICK, operated by an electric hoist, is helping to construct a new plant for the Minnesota Steel Co., Morgan Park, Minnesota. It is equipped with the Renewable base and all Clyde features.
CLYDE

The CLYDE-Grade Steel Clam Shell Derrick

All CLYDE Steel Derricks embody several distinctive "CLYDE-Grade" features. The Renewable Double-Bearing Ball & Socket Base is an example. With its double bearing surfaces, renewals may be made at the mere cost of a new "ball" & stem instead of an entirely new base.

CLYDE-Grade Line: *Manufacturers of Steam, Electric, Gasoline & Belt Hoists, Derricks; Excavators; Blocks & Sheaves, etc.*

(Complete Catalog sent on request)

CLYDE IRON WORKS
DULUTH, MINN., U.S.A.

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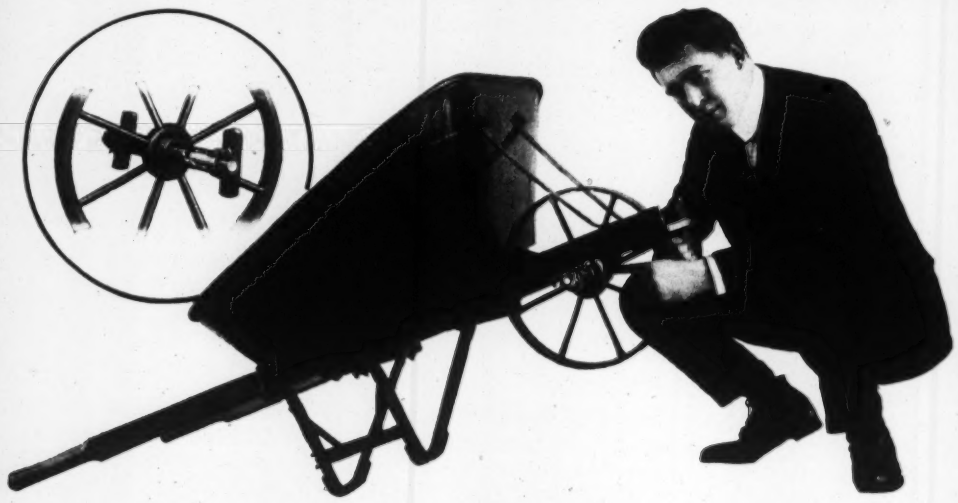
PORTLAND ORE. 18TH & UPSHUR STS.

Sterling



Here's Long Life and Easy Running

Get this important point of Sterling construction fixed in your mind:

The self-lubricating bearings easily double the life of the Sterling as compared with ordinary barrows.

It reduces the maintenance to positively nothing.

It does away with the trouble and expense of oiling, and it never squeaks.

This feature is common to every Sterling wheel. Self-oiling composition bushings are fitted into the unbreakable steel hub and revolve on a 5/8-in. cold rolled steel axle.

All Sterling wheels are the same size and interchangeable.

Ten Other Sterling Features

Forged Steel Wheel Guard
Cold Rolled Steel Wheels
Malleable Wheel Supports
Broad Flat Feet on Legs
Tested Clear Maple Handles
Riveted Leg Braces
Patented Handle Clamps
Balanced Load
All Parts Interchangeable
Cotter Pinned Axles

If you're looking for real wheelbarrow economy, buy Sterlings. Catalog on request

Sterling Wheelbarrow Company, Milwaukee, Wisconsin

New York, 30 Church St. Chicago, 30 So. Jefferson St. Detroit, 18 Columbia St. Cleveland, 422 Frankfort Ave.

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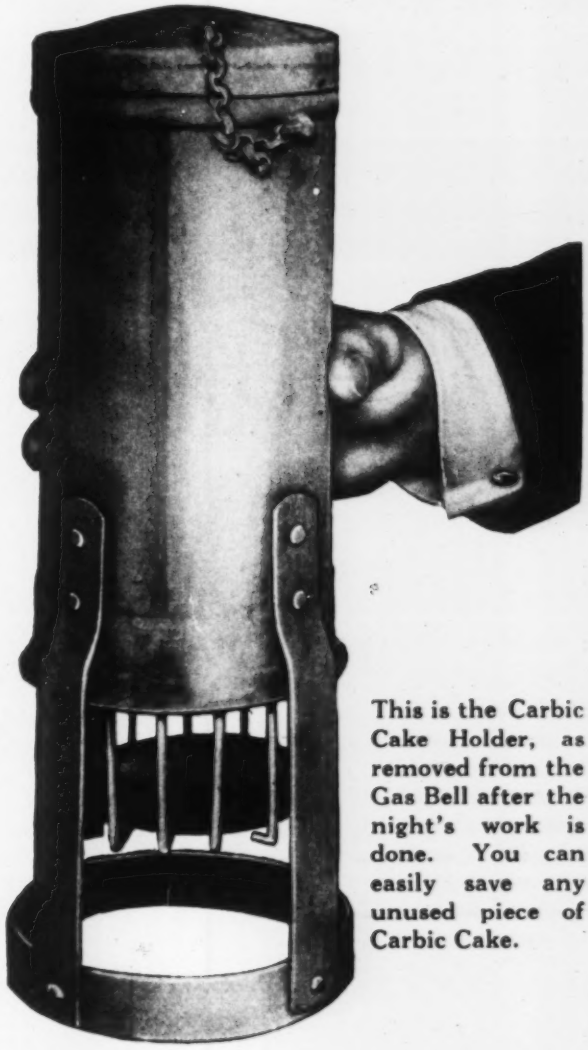
If there's an ounce of Carbic Cake left over use it next night



This is the Carbic Cake Holder, as removed from the Gas Bell after the night's work is done. You can easily save any unused piece of Carbic Cake.

1—Candlepower remains constantly uniform. **No diminution** in brilliancy. **The same degree** of light to within the last 15 minutes of a full charge. YOU GET all the light you pay for **all the time** from Carbic—because

2—Gas pressure stays constantly uniform. **No soot, no smoke.**

3—Absolute simplicity. Only 3 substantial hollow parts which **cannot** be assembled wrong.

4—Ignorant labor can't waste Carbic Cake in charging, recharging or cleaning.

5—Simple charging. Just drop Carbic Cakes into Cake Holder, slip holder into gas bell and lower bell into water tank.

6—No gas freed until you turn the valve. Over generation **impossible.**

7—Simple recharging. Just add Carbic Cakes and water.

8—Simple cleaning. Remove bell and cake holder. Slosh water around in water tank and dump. This removes sludge.

9—Economy in Carbic. Any unused piece of Carbic Cake has been only **momentarily** touched by water on under side Remove it from holder and save for re-use.

10—Safety. Kick over a Carbic, **lighted.** It goes out instantly.

11—Big stocks of Carbic Cakes always on hand (at a uniform price) for **quick delivery anywhere.**

12—Service. A Carbic Service Man at your command to advise on lighting your job most efficiently.

A no-cost-to-you try-out of Carbic Lights **under practical conditions** on your own job is our proposition. This is what sells Carbic to cost-counting contractors.

If there's one thing you want in a light next to **undiminishing candlepower,** it's economy in **lighting material.** Conservation of Carbic Cake is a Carbic feature. The holder you see here slips inside the gas bell. When both are lowered into the tank, the water can only touch **one** Cake on its underside, and that only **momentarily.** Consequence is, when the night's work is done, all unused Carbic cake is simply dropped out of the Holder back into storage, **good as new for another round.**

Simple, isn't it? Big stock of Carbic Cakes for prompt delivery everywhere.

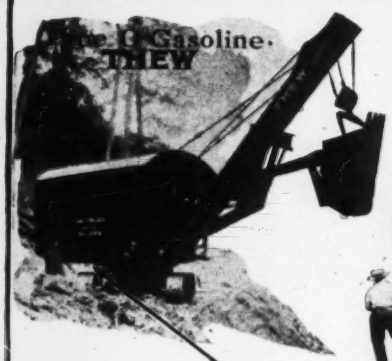
CARBIC MANUFACTURING CO., Duluth, Minn.

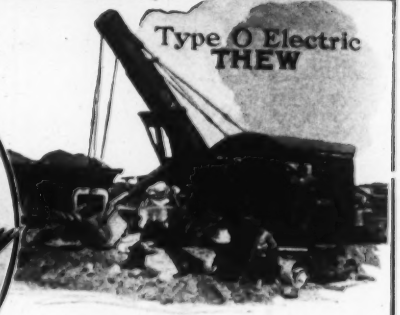
Chicago, 111 W. Washington St. Boston, 27 School St. Philadelphia, 18 South 7th St. New York, 52 Vanderbilt Ave. Pittsburgh, 327 Water St. Detroit, 18 Woodward Ave. Cleveland, 77 Rockwell Ave.

Warehouses and representatives in other principal cities. Write branch office for address of nearest representative.

CARBIC CAKES Save Money, Time and Patience

ALLIED

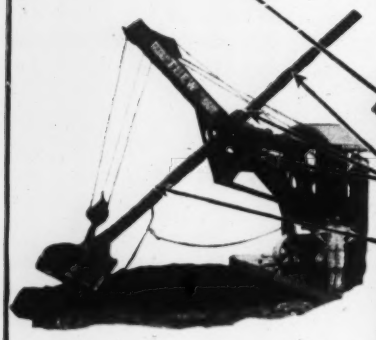


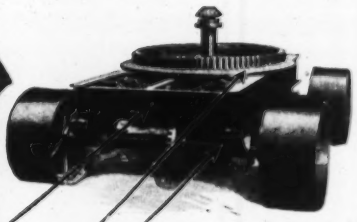


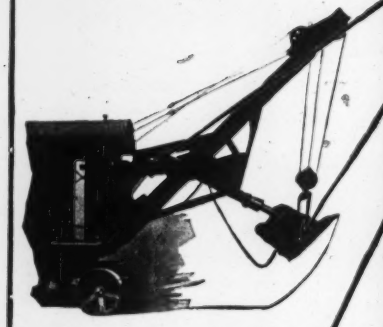
THEW

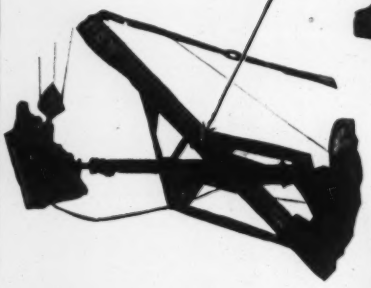
Standards

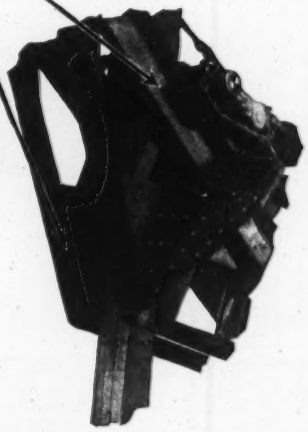
Full Circle Swing
Combination Boom
Shipper Shaft Mechanism
Dipper Sticks (single or double)
Shipper Shaft Dipper Sticks (14 ft. Standard on Types O and A-1)
Horizontal Crowd
Dippers
Built-up Trucks
All-steel Booms—"Built-like-a Bridge"
Steering Devices
Sliding Steel Wedge Blocks
Low Roller Path
Tubular Boilers
Throttle Engines
Accessibility
Axles
Lateral Support of Dipper Stick











Each of these Thew Construction Standards has been dealt with in detail in consecutive issues of Engineering News-Record. These features show exactly why Thew Shovels give maximum performance service at minimum operating cost. The complete "Standards" Series is issued in bulletin form. Copy of this "Standards" Bulletin will be furnished for the asking.

Manufacturers of six sizes—sixty combinations of power shovels built of Thew Standard Machinery Units, equipped with Combination Boom, Shipper Shaft or Horizontal Crowd—Steam, Gasoline, Electric,

"Thews Are Everywhere"

FULL CIRCLE SWING POWER SHOVELS

The Thew Automatic Shovel Company
LORAIN, OHIO New York Office: 30 Church Street

ALLIED — ALLIED CONSTRUCTION MACHINERY CORPORATION — ALLIED
Export Department
120 Broadway New York, U.S.A.

Austin Has Suitable Equipment for Every Road Building Process

WHAT HOOVER SAYS

Washington, D. C., Feb. 2, 1918.

F. A. Cannon,
Executive Secretary, Good Roads Association of Wisconsin, Madison, Wis.

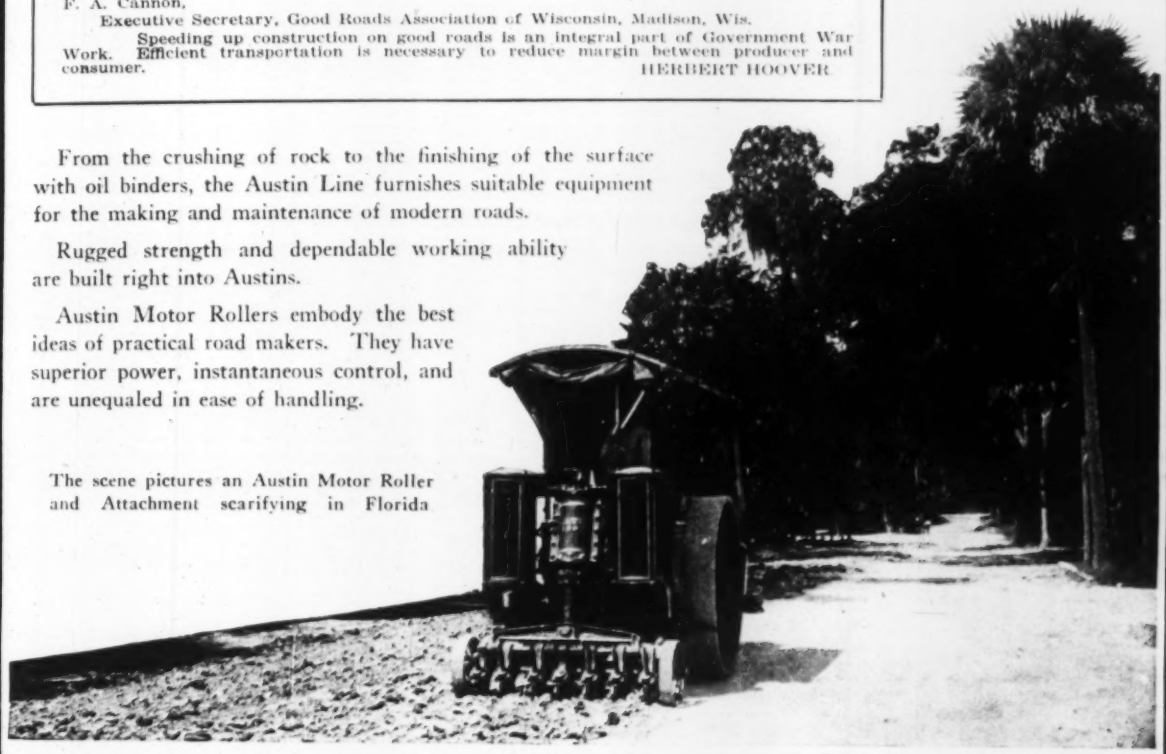
Speeding up construction on good roads is an integral part of Government War Work. Efficient transportation is necessary to reduce margin between producer and consumer.

HERBERT HOOVER

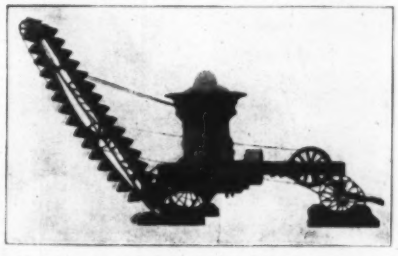
From the crushing of rock to the finishing of the surface with oil binders, the Austin Line furnishes suitable equipment for the making and maintenance of modern roads.

Rugged strength and dependable working ability are built right into Austins.

Austin Motor Rollers embody the best ideas of practical road makers. They have superior power, instantaneous control, and are unequaled in ease of handling.



The scene pictures an Austin Motor Roller and Attachment scarifying in Florida



Portable Gyratory Crusher

Austin Gyratory Crushers are made in 8 sizes—50 to 5000 tons daily capacities. Leading quarrymen endorse them as MONEY MAKERS and MONEY SAVERS.

The Complete Austin Line

Gyratory Rock Crushers	Road Scarifiers
Motor Tandem Rollers	Combined Scarifier Graders
Motor Macadam Rollers	Street Sprinklers
Portable Stone Bins	Street Sweepers
Stone Elevators	Combined Sprinkler-Sweepers
Stone Screens	Dump Wagons
Elevating Graders	Stone Spreaders
Blade Graders	Horse Drawn Rollers
Road Rollers	

Every item is constructed in a number of styles and sizes to meet variable requirements.

Write for free Descriptive and Illustrative Catalog on any or all of this equipment.

Austin Manufacturing Company, Chicago

New York

Sales for FRANCE, SPAIN, ITALY, PORTUGAL, BELGIUM and their Colonies, THE WEST INDIES and CHINA handled by
ALLIED CONSTRUCTION MACHINERY CORPORATION
120 Broadway New York, U.S.A.

San Francisco

These Forms Make Round Columns Perfect

Walk through a modern factory building and observe the round concrete columns. Some are perfectly formed, perfectly finished—an ornament to the building, as well as a necessity. Some look ragged, the form is "off" and the pleasing effect is lost.

It costs no more to have perfectly formed and finished concrete columns when Hydraulic Pressed Steel Column Forms are used. A graceful column is assured, while a concrete finish of greater density—due to less leakage—is produced.

Hydraulic Forms give more permanent results and save time and labor.

"Hydraulic"

Standardized Steel Column Forms

are a real economy because they are easy to assemble—due to standardization—easy to take down. They are a good investment because they hold tight and thus eliminate the danger of a rough, broken finish.

Ask our Service Department to submit proof of the advantages and economies of Hydraulic Steel Forms.

The Hydraulic Pressed Steel Co.
Cleveland, Ohio.

Manufacturers of Wall, Column, Sewer, Tunnel and House Forms

New York Office: Singer Bldg., 149 Broadway
Chicago Office: Fisher Bldg., 342 Dearborn Street
Washington Office: Lafayette Hotel

ALLIED — Export Department — ALLIED CONSTRUCTION MACHINERY CORPORATION — 50 Broadway, New York, U.S.A. — ALLIED

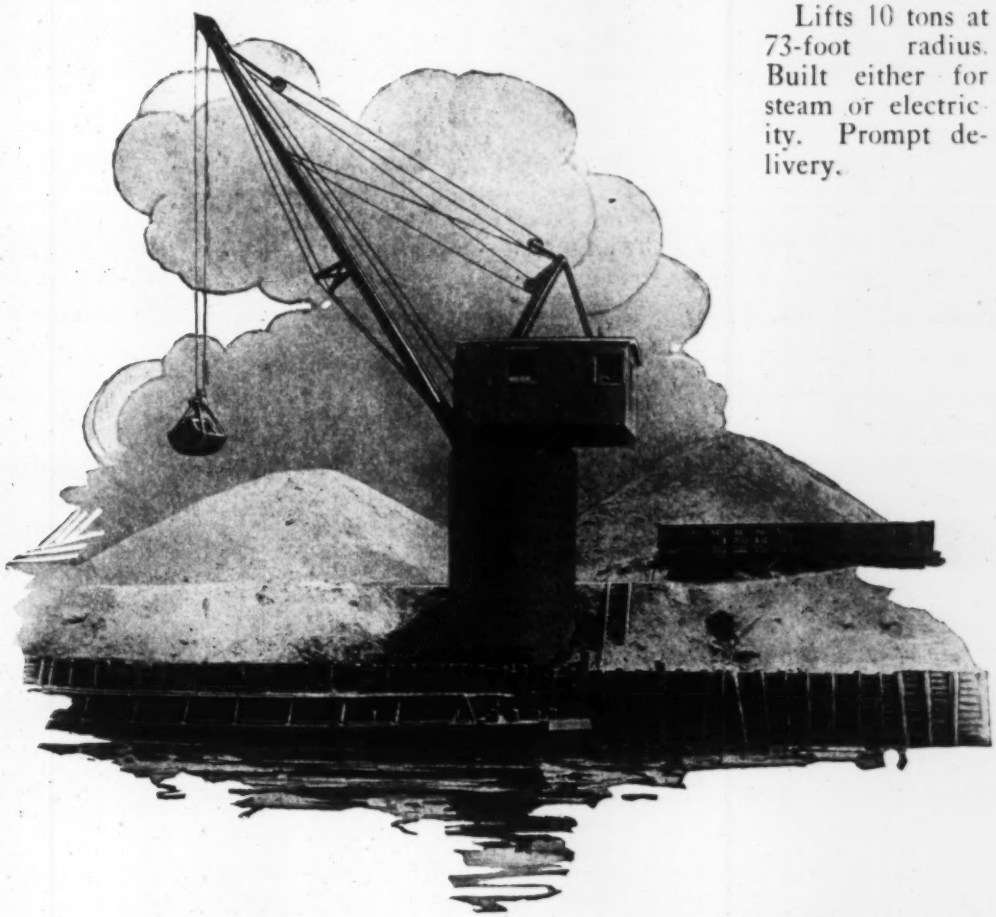
24,000 Square Feet Served

THIS Dravo-Whirler, with 75-foot boom, rotating through 360° in 45 seconds, serves an area 150 feet in diameter.

A Dravo-Whirler handles rapidly and economically ALL materials necessary for concrete mixing.

It can unload cars, stock the materials, charge the mixer bin, handle forms, drive piles (with auxiliary false leads), and perform many other tasks around a contracting job.

Lifts 10 tons at 73-foot radius. Built either for steam or electricity. Prompt delivery.



Class A Whirler
75-foot boom; lifts 10 tons at 73-foot radius

Class B Whirler
55-foot boom; lifts 5 tons at 53-foot radius.

Send for Bulletin.

THE DRAVO CONTRACTING CO.

Engineering Works Department
DRAVO DOYLE COMPANY
PITTSBURGH, PA.

Chicago **Philadelphia** **Cleveland** **Indianapolis**

To look at this you'd hardly think it once was a Fine Wire Rope

MADE of the best steel, in the most scientific way, by a leading wire rope manufacturer, this rope was shipped out to a difficult job.

A glance at the rope will show you that the core has been eaten away by the acid water in which it worked. The wires are worn and corroded to the breaking-point, outside and inside.

The conditions are hard—yet such rapid and complete destruction is not necessary.

For, only a short distance away from where this rope was taken is one of the same age and shipment—**STILL WORKING.**

It has already completed more than three times the hoisting of the one we show here.

The purchaser of these ropes unhesitatingly attributes the longer life of the other rope to the use of

Texaco Crater Compound

The first mentioned rope was improperly lubricated.

The second was protected from

corrosion of the metal
rotting of the core
external wear
internal friction

because it was laid up in **TEXACO CRATER COMPOUND** during the process of manufacture and given light treatment thereafter.

Protect your ropes in the same way. Particularly if they are working in sulphur or saline waters. Specify that they be laid up in **TEXACO CRATER COMPOUND.**

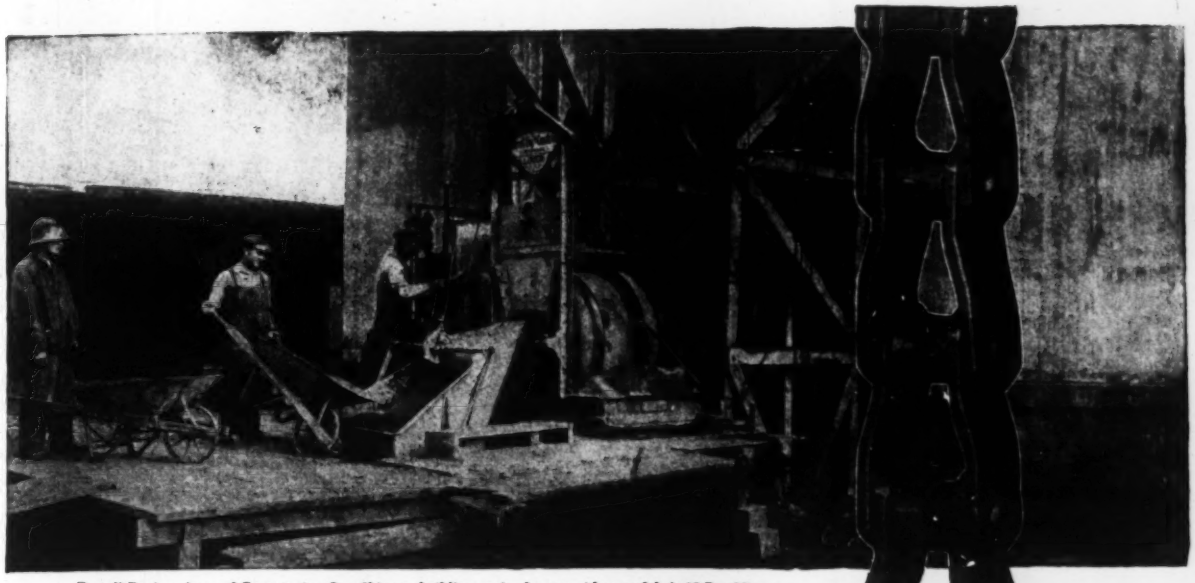
Most wire rope manufacturers will be glad to do so. Then treat them regularly with light applications of **TEXACO CRATER COMPOUND.**

"WIRE ROPE LUBRICATION" tells more about it. Write for a copy today.

Photo from pages of Wire Rope Lubrication

Write for a copy of "WIRE ROPE LUBRICATION." It tells why CRATER treated ropes last longer.

THE TEXAS COMPANY
"Dept. N-2," 17 Battery Place, N. Y. City
HOUSTON CHICAGO NEW YORK
Offices in Principal Cities



Burrell Engineering and Construction Co., Chicago, building grain elevator with one of their 27 Rex Mixers

No matter what the nature or size of your concrete job may be, there is a Rex Mixer—at a very fair price—to give you the Rex benefits of continuous operation and low maintenance cost. No matter where you may be there is a Rex representative near you who can tell you just what Rex Mixers are doing on jobs like yours. He will be glad to show you such Rex features as the all-steel chain drive, the steel frame and the hoisting engine clutch—all of which the Rex was the first to employ. And he will refer you to other contractors who have expressed their unqualified approval of the Rex by adding one or two each year until they used only Rex Mixers.

CHAIN BELT COMPANY, MILWAUKEE
11th Ave. Viaduct

REX MIXERS

Rex Traveling Water Screens, Rex Chains, Rex Sprockets, Rex Elevators and Conveyors

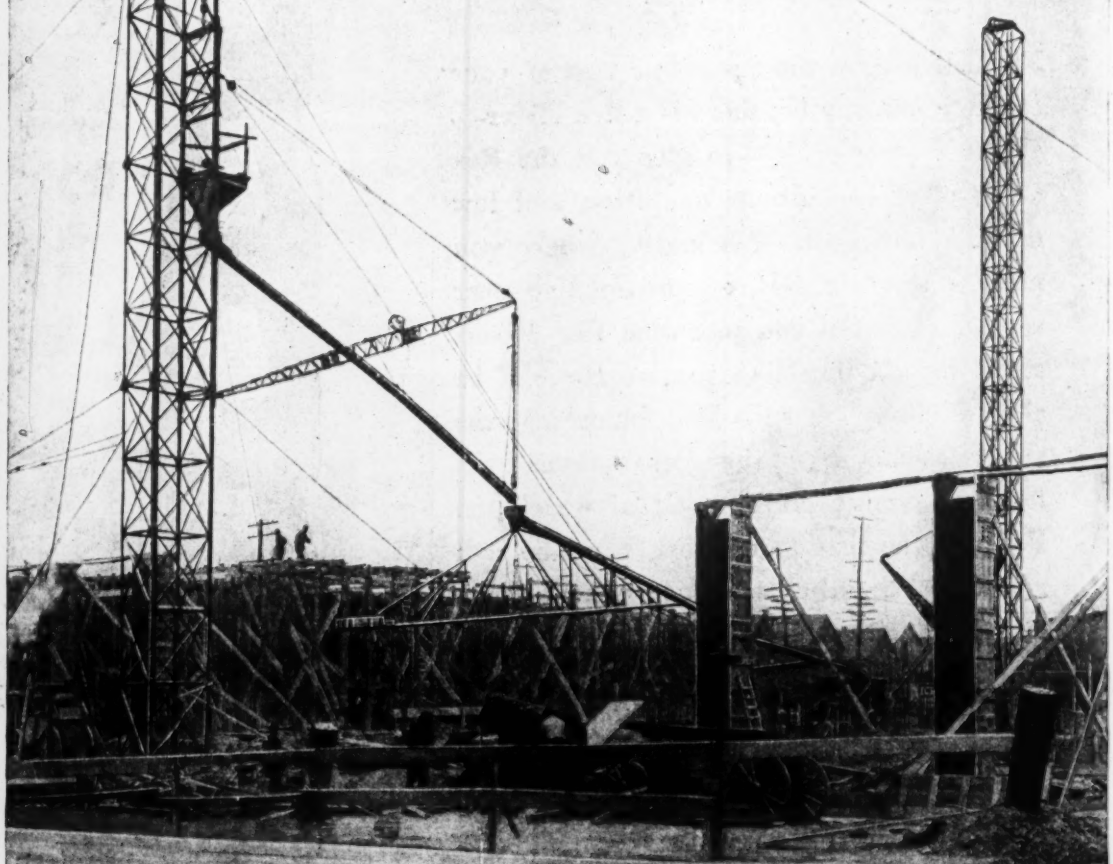
Rex Roller Chain of the Chabelco type used for the chain drive on Rex Mixers.

Prompt Deliveries

Concrete Placing Equipment

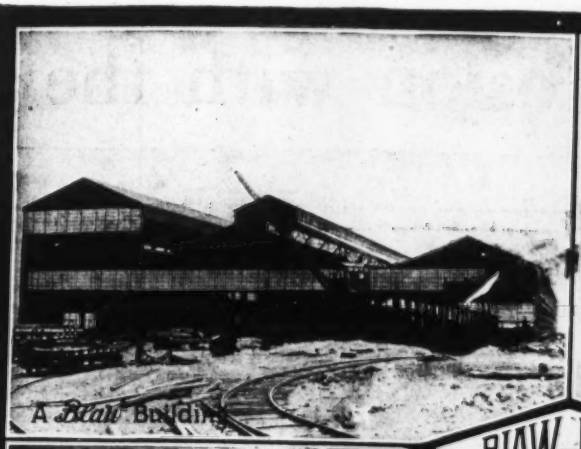
Industrial Cars

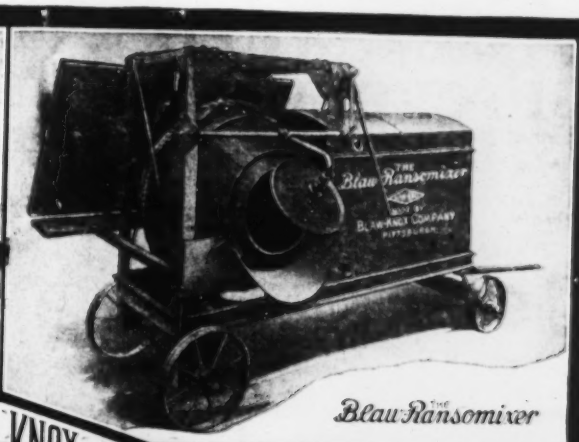
Steel Guy and Stiffleg Derricks



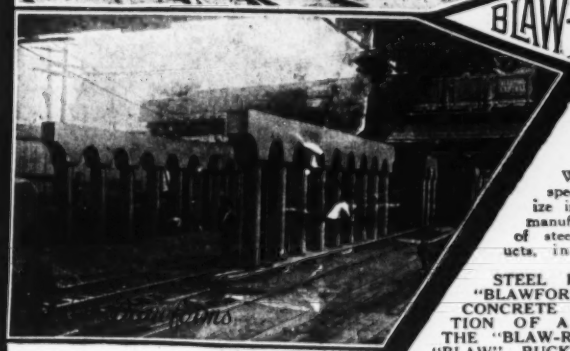
INSLEY MANUFACTURING CO.

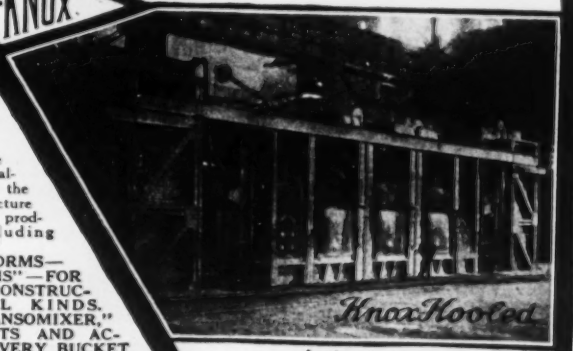
Manufacturers INDIANAPOLIS *Engineers*





BLAW-KNOX





We specialize in the manufacture of steel products, including

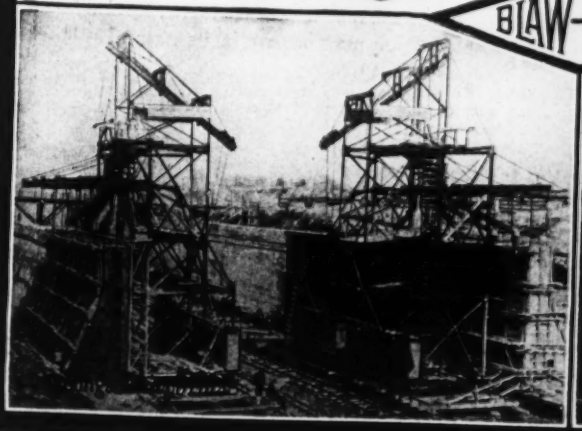
STEEL FORMS—"BLAWFORMS"—FOR CONCRETE CONSTRUCTION OF ALL KINDS, THE "BLAW-RANSOMIXER," "BLAW" BUCKETS AND ACCESSORIES FOR EVERY BUCKET PURPOSE, "BLAW" FABRICATED STRUCTURAL STEEL, STEEL PLATE WORK, "BLAW" TRANSMISSION TOWERS, "KNOX" PRESSED AND WELDED STEEL PLATE CONSTRUCTION, "KNOX" WATER COOLED FURNACE EQUIPMENT

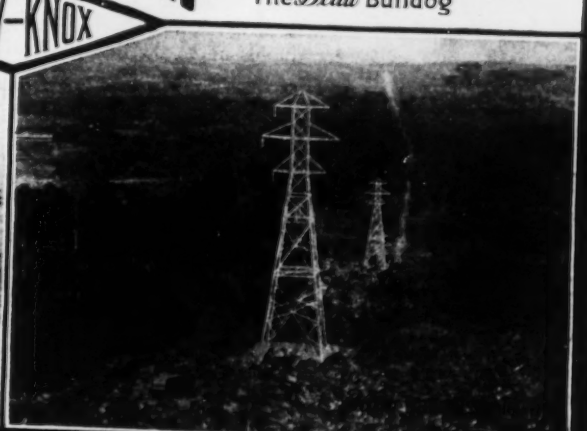
Our engineers are at your service at all times. Data and literature will be sent upon request.

BLAW-KNOX COMPANY

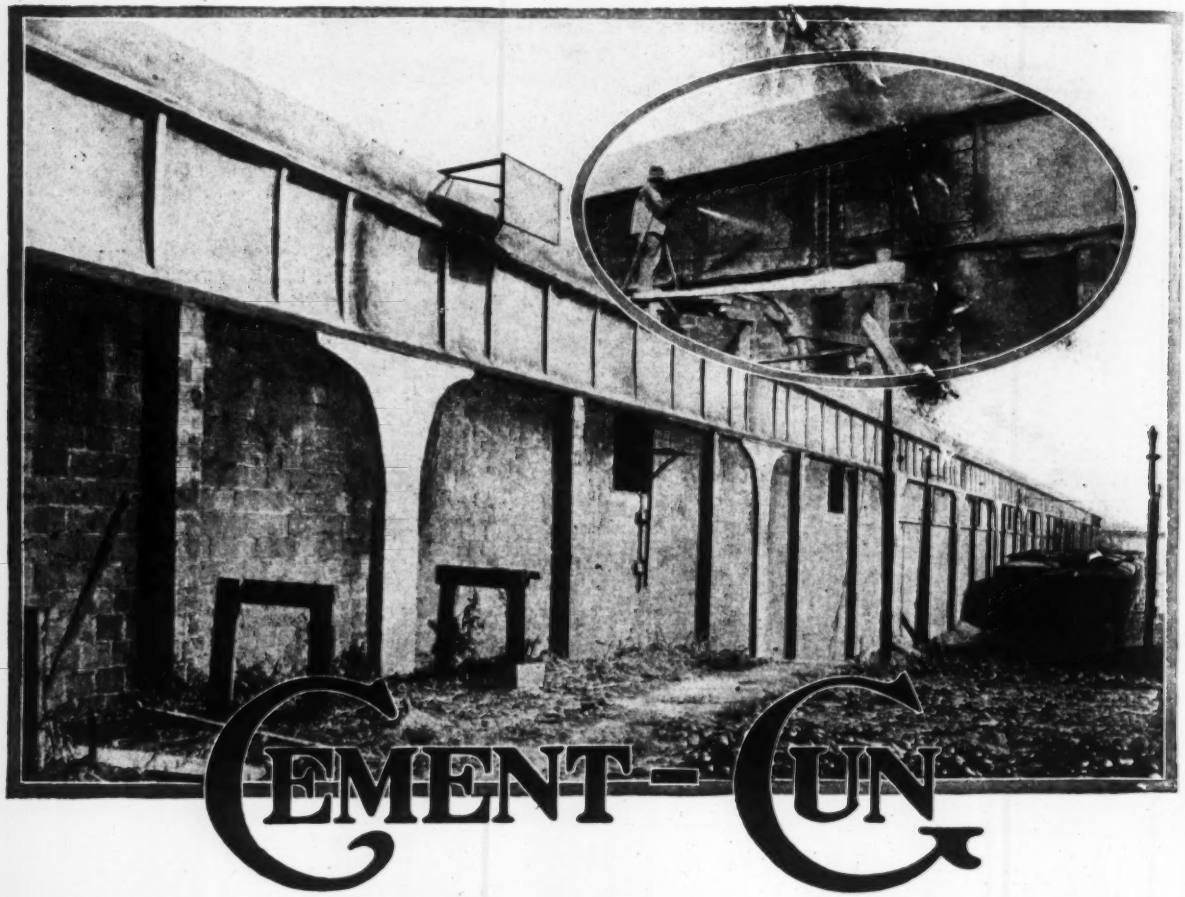
601 Farmers Bank Bldg.
Pittsburgh, Pa.
New York, 165 Broadway
Chicago
Peoples Gas Bldg.
San Francisco
528 Second St.

BLAW-KNOX





Preventing Corrosion with the



No matter how carefully concrete is applied to structural steel, voids are sure to exist. But with the CEMENT-GUN, the cement-sand product **"GUNITE"** is shot out so forcibly by compressed air that it builds up tough, hard and practically voidless.

The illustration shows the method used in applying **"GUNITE"** to structural steel. It is the work of the Universal Cement-Gun Construction Company, Inc., of New York, for the Brooklyn Rapid Transit Co. Reinforcing mesh is attached and the operator sways the nozzle until **"GUNITE"** builds up to the desired depth. The finished job may be left in its natural "rough-cast" finish or hand floated to a smooth surface.

This and other interesting facts are clearly described and illustrated in the Book of Bulletins.

Write for Your Copy.

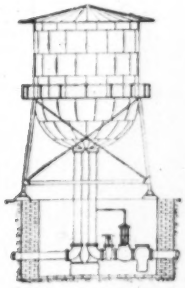
CEMENT-GUN COMPANY. Inc.

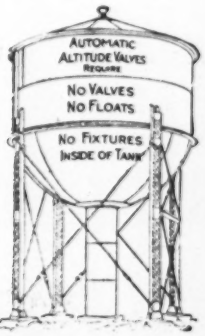
ALLENTOWN, PA.

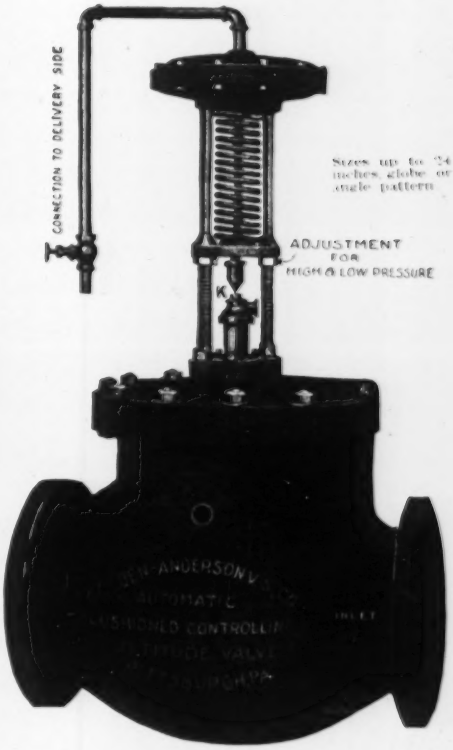
New York Office: 30 Church St. *Chicago Office:* 1414 Fisher Bldg.

John A. Taylor, Newhouse Bldg., Salt Lake City, Utah. Taylor Engineering Co., Vancouver, B. C. Taylor Engineering Co., 538 Central Bldg., Seattle, Washington. R. E. Cleaton & Co., 20 St. Nicholas St., Montreal, Can. General Supply Co. of Canada, Ltd., Winnipeg, Can.

The Cement-Gun can be purchased outright from us and used by anyone.. It is not a restricted article.







Steady Water Level Means Econony

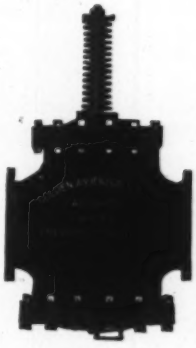
The logic of this will appeal to you when you consider that a constant water level would eliminate the waste of water running down the overflow of your reservoirs, standpipes and tanks. It would also save the power and therefore the coal required for pumping this waste water.

You can carry a perfectly uniform level and realize these savings by equipping your supply mains with

GOLDEN-ANDERSON
Patent Automatic Cushioned Controlling Altitude Valves

1. Automatically maintain a positively constant water level.
2. Operate without auxiliary floats or fixtures, either inside or outside of the tanks.
3. Perfectly cushioned by water and by air. No metal to metal seating. No banging, sticking or chattering. No water hammer, surges or burst mains.
4. The valves can close in three ways—automatically by increased water pressure—by electricity from distant points—by hand.
5. On a single pipe line the valves may be so connected as to work "both ways," closing automatically the instant that a break occurs.
6. Require no adjustment or care in service. Can be housed in to prevent freezing.
7. Can also be connected to return the water for distribution wherever the pressure at the inlet side than at the outlet.

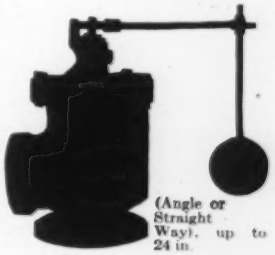
Golden-Anderson Patent Cushioned Water Pressure Regulating Valves



1. The delivered water pressure will always be constant, regardless of pressure changes on the inlet side.
2. High pressure can never accidentally enter the low pressure side, due to the unfailing action of the patented safety piston.
3. Perfect cushioning by water and by air. No metal to metal seating, water hammer or surges.
4. No auxiliary valves or small water passages to clog.
5. All adjustments can be made from the outside.
6. Can be fitted with simple electric solenoid for closing from distant points.

Golden-Anderson Patent Automatic Cushioned Float Valves

1. Control the water level in tanks, hot wells, vats, stills, etc., between two fixed points, the distance between which can be varied as desired by a simple adjustment.
2. They eliminate water waste.
3. Can be made to open quickly or slowly.
4. The swiveling float facilitates installation.
5. Positively cushioned by water and air.



(Angle or Straight Way), up to 24 in.

Golden-Anderson (Pat.) Life and Property Insurance Valves

A sure protection against complete shutdown in case a tube ruptures in any one boiler, or a steam pipe should burst.

These G-A Patent Automatic Double-Cushioned Triple-Acting and Non-Return Valves have proved indispensable in hundreds of boiler plants.

1. Automatically cut a damaged boiler out of the line.
2. Automatically shut off steam flow from all boilers in case a steam pipe ruptures.
3. Automatically equalize steam pressure.
4. Prevent back flow into cold boiler.
5. Can be tested in service.
6. The U. S. Steel Corporation now uses 1450 of these valves.

"HOSTS OF REFERENCES"—"EVERY VALVE WITH AN ABSOLUTE GUARANTEE"

GOLDEN-ANDERSON VALVE SPECIALTY CO.

1202 FULTON BLDG. **Water and Steam Specialties.** **PITTSBURGH, PA.**

BETHLEHEM STEEL COMPANY

IRON AND STEEL PRODUCTS

GENERAL OFFICES:
SOUTH BETHLEHEM, PA.

"There's Where We Are Wasting Profits and Valuable Labor Daily"

"We are paying high wages to a gang of shovelers, which our factory is struggling to keep up production on a constantly increasing labor shortage.

"Now's the time to make a change—put these fellows on productive work and substitute a Jeffrey Loader.

"I have seen a number of these machines in operation and the owners are highly pleased with them. Bannigan says that if they could not replace their Jeffrey Loader (illustrated below) they would not sell it for $10,000.00."

The Jeffrey Self-Propelling Loader

Does the Work of 5 to 10 Men in Loading Coal, Stone, Sand, Gravel, Ashes, Coke, Foundry Refuse, and similar materials.

An inexpensive machine that can be operated by any yard laborer—one man control—practically fool-proof—and will last for years under the hardest service.

Over 400 Jeffrey Loaders now in operation.

Bulletin No. 177-I has the facts complete.

Address Loader Dept.

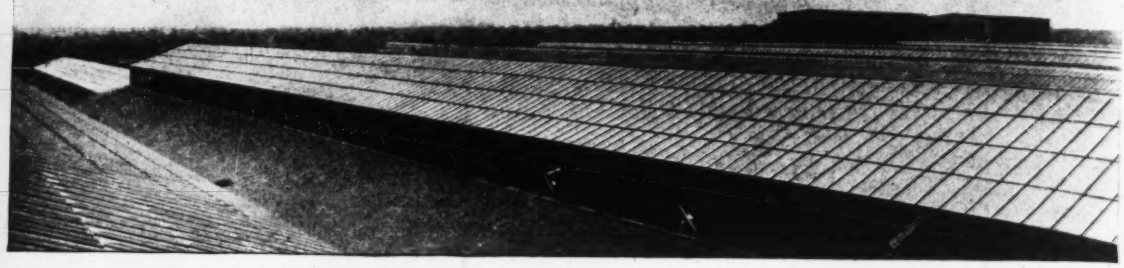
The Jeffrey Mfg. Co., 923 N. Fourth Street, Columbus, Ohio

A Jeffrey Collapsible Loader in operation at the yards of McQuade & Bannigan, Building Supply Dealers of Utica, N. Y.

This Jeffrey Loader was installed to replace a hand-propelled Loader, which had been found very inconvenient and expensive

Lupton

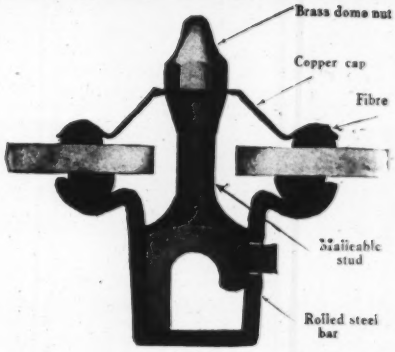
INVESTMENT VALUE



Eddystone Ammunition Mfg. Corp.
Eddystone, Pa.
142,000 square feet of Lupton
Rolled Steel Skylight used

ALTHOUGH skylights cannot be classed with modern ventilating types of roof, they give good service over light courts, high-roofed buildings where the ventilating requirements are small, and gymnasiums, swimming pools, etc.

But a worth-while skylight must be *dependable.* It must not endanger heads below by breakage or goods and machinery by leakage. It must not rust out before it has earned its right to retire.



Lupton
Rolled Steel Skylight

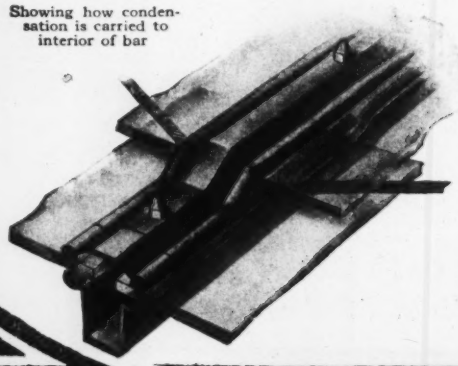
gives a strong yet elastic support to the glass, without metal contact and with free opportunity for expansion and contraction.

Water-tightness depends, not on putty, but on the strands of specially saturated fiber between which the glass is held. Those never dry out.

The ⅛-inch channel bar remains in service long after the ordinary galvanized skylight bar has failed by corrosion. The inside of the bar is protected from gases; its outer surface is readily painted.

Some of the largest industrial concerns in the country use Lupton Rolled Steel Skylight. Shall we tell more?

Showing how condensation is carried to interior of bar



The No. 9 Catalogue describes fully this and other Lupton Products.

We are glad to advise customers, on request, regarding the correct use of skylight and ventilating sash.

DAVID LUPTON'S SONS COMPANY
Tulip and Westmoreland Sts.
Philadelphia, Pa.

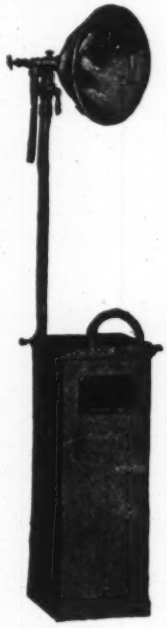
Lupton
PRODUCTS
Lupton Steel Sash
Pivoted Factory Type
Counterbalanced Type
Pond Continuous Sash for saw-tooths, monitors and side walls
Pond Operating Device for long lines of sash
Lupton Rolled Steel Skylight
"INVESTMENT VALUE"

NEW MILBURN

The Lights That Use

ORDINARY CARBIDE

—the kind that sells EVERYWHERE for $4.75 a drum of 100 lbs. and gives 500 cu.ft. of gas



You don't have to *"change the water"* when you re-charge a Milburn—a point worth considering when on a job where water must be brought from some distance, especially when several lights are being used.

You simply re-fill the pockets of the carbide holder and put the gas cylinder back in the tank —and you get over 8000 candlepower of powerful white light for over 12 hours at a cost of about 3c per hour!!

You just dump out the carbide holder and re-fill

Send for Booklet 21.

"The Lights That Never Fail"

CUT-WELD TORCH

An Oxy-Acetylene torch with tips for cutting and tips for welding. A strong, simple, double-duty torch that has performed with uniform success in rigid tests held by the Stone & Webster Corp., the U. S. Signal Corps, the U. S. Quartermaster's Dept., and other important bodies. Write for Circular 31.

GENERATORS—COMPRESSORS—TORCHES

The Alexander Milburn Co.

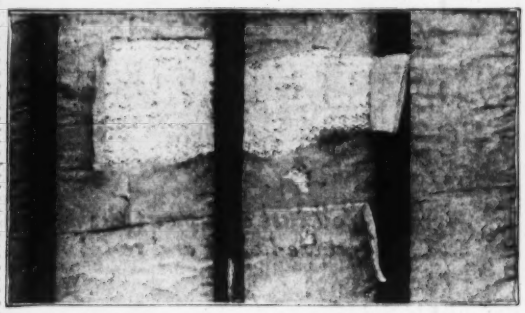
Baltimore, U. S. A.

NEW YORK: 51 E. 42nd Street | CHICAGO: 1012 Kimball Bldg. | BOSTON: 79 Milk Street | PITTSBURGH: 406 Bessemer Bldg. | WASHINGTON: 711 13th Street, N. W.

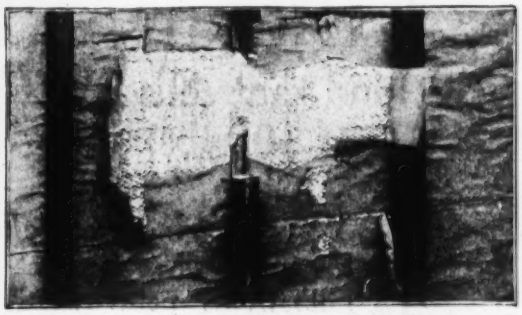
Agents Everywhere

Nemco Products

Low Cost—
Permanent Exterior Walls



Sheathing paper cut away to show key of stucco.



Section of stud cut away to show key over face of stud.

This type of stucco construction is especially adapted to industrial houses.

The heavy, water-proof building paper is all the sheathing that is required. Over this is applied

TRADE MARK

Kno-Burn

REG. U. S. PAT. OFF.

Corrugated Expanded Metal Lath

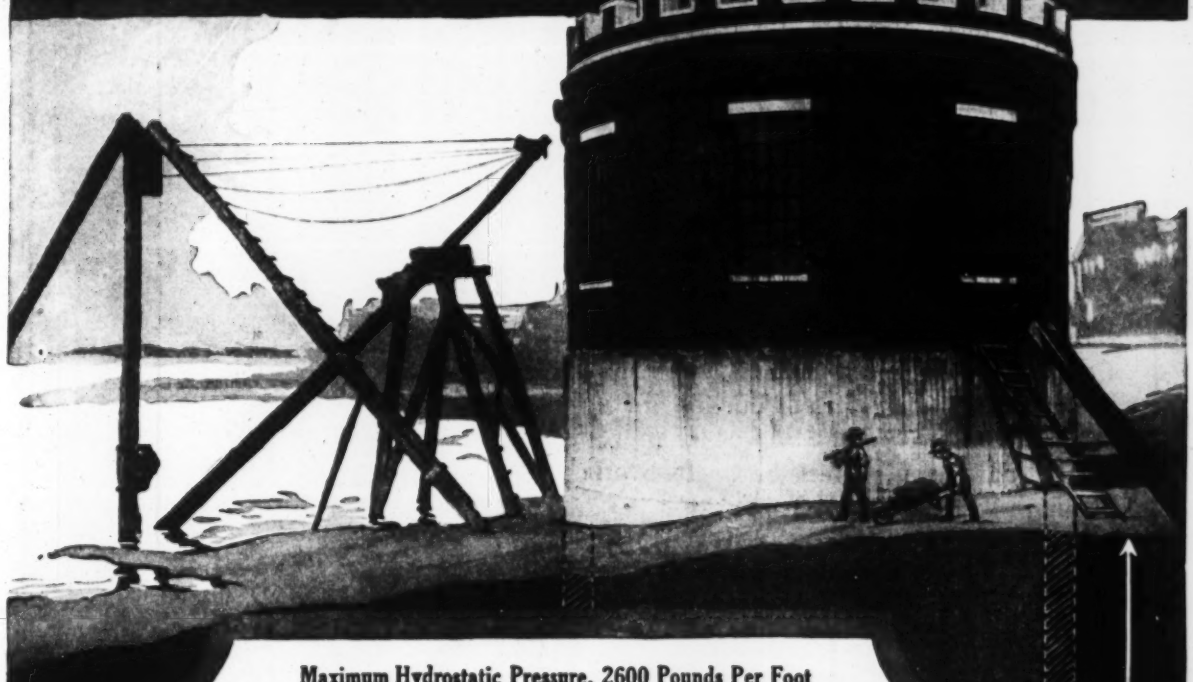
The corrugations act as furring strips so that the stucco flows between the lath and the building paper, forming an almost perfect key as shown in the illustration.

Send for our Kno-Burn Booklet No. 3, a complete hand book on metal lath construction.

North Western Expanded Metal Company
Member of the Associated Metal Lath Manufacturers
900 Old Colony Building, Chicago, Illinois

Kno-Burn
Corrugated
Expanded
Metal Lath

GF No. 10 INTEGRAL Waterproofing Paste



Maximum Hydrostatic Pressure, 2600 Pounds Per Foot

THIS pump well of the Public Utilities Co., Evansville. Ind., is located on the edge of the Ohio River. It is sixty feet deep, about twenty-five feet in diameter and has eighteen-inch reinforced walls. The bottom of the well is five feet lower than the river bed. This well is subject to a constant pressure from a forty-three foot head of water, and it is absolutely bone dry.

The concrete mixture is 1:2:4 with two pounds of GF No. 10 Integral Waterproofing Paste to each bag of cement.

GF No. 10 is a smooth paste which is dissolved in the gauging water and carried into every part of the concrete mass. It is absolutely soluble and remains in perfect suspension, which insures uniform distribution.

GF No. 10 waterproofs permanently and in no way affects the set or strength of the concrete.

Ask for the GF Waterproofing Handbook. It shows many other uses for GF No. 10 and covers the application of entire line of GF Waterproofings. Sent on application to Engineers, Architects and Contractors.

60 FT. UNDER GROUND

THE GENERAL FIREPROOFING CO.
YOUNGSTOWN, OHIO

Manufacturers of Metal Lath Concrete Reinforcements and Waterproofings

Branch Offices: **Chicago, Philadelphia, Atlanta, Utica Buffalo, Kansas City**

Members of Associated Metal Lath Manufacturers

GF YOUNGSTOWN, OHIO

Stocks in Principal Cities

THE LEYNER JACKSTEEL SHARPENER FOR SMALL ROCK DRILL STEELS

This machine offers the user of "Jackhamers" or similar machines all the advantages of machine sharpened bits at remarkably low cost.

The "Jacksteel Sharpener" represents a very moderate investment and the cost of its operation is, by comparison with hand work, so inexpensive that it pays a handsome profit to the user of but few drills. The Leyner Jacksteel Sharpener makes and resharpens perfect bits. Its work cannot be other than of absolute accuracy in form and gauge. This advantage is your insurance against lost drilling time due to stuck steels.

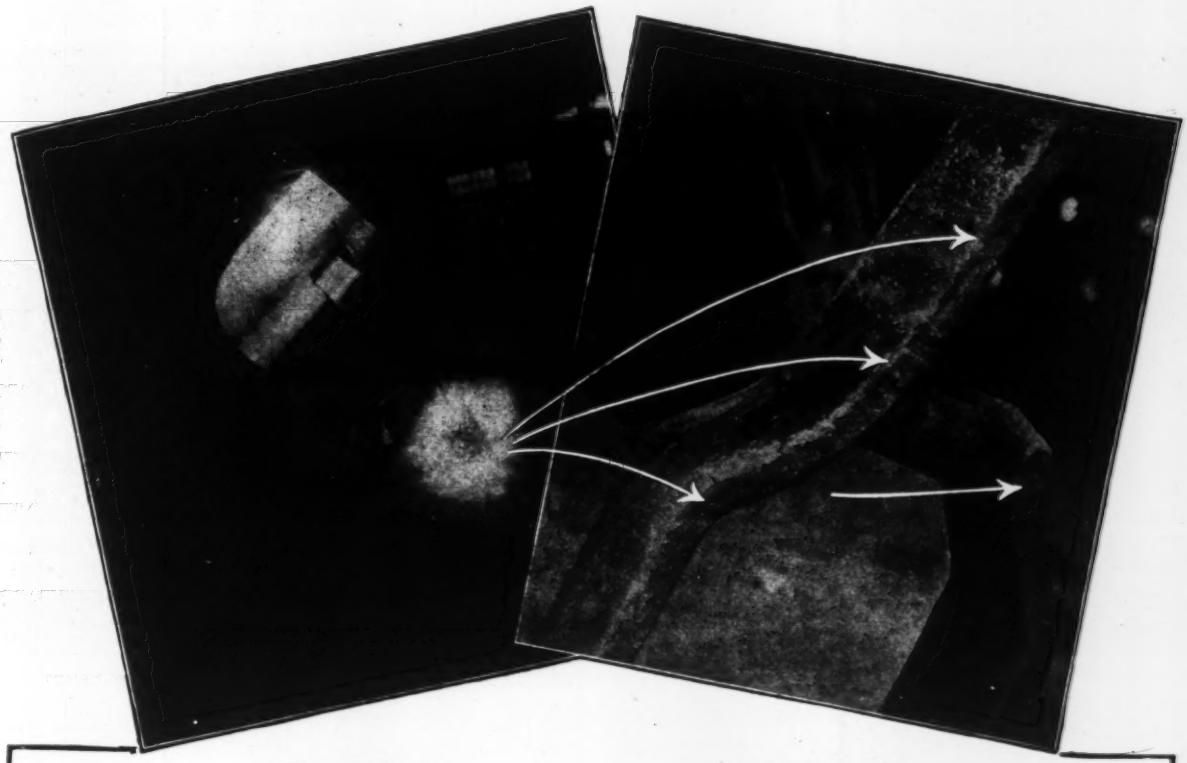
Ask for Bulletin No. 4037.

INGERSOLL-RAND COMPANY

11 Broadway, New York
165 Q. Victoria St., London
Offices the World Over

Air Compressors—Rock Drills

70-LDS



The Method ***The Result***

Reclamation of Iron Castings by Arc Welding Is Very Successful

Reclaiming 98% of all the defective castings they attempt is the remarkable accomplishment of the Spencer Heater Company, Scranton, Pa. Castings repaired by the G-E Arc Welding process are as good as those that are cast perfect.

The skill and organization required for this work has been gradually built up by the Spencer Heater Company, which was a pioneer in the use of cast iron electrodes.

Casting reclamation is but part of the valuable and varied work done by the G-E Arc Welding Equipments at the Spencer Heater Company.

To save time and money, build up worn or broken ferrous parts with G-E Arc Welding Outfits.

General Electric Company

General Offices: Schenectady, N. Y.

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Columbus, Ohio
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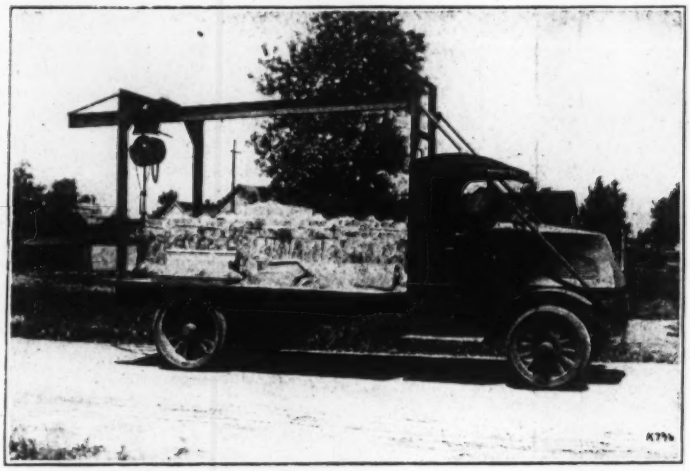
* Southwest General Electric Company. For Canadian Business refer to Canadian General Electric Company, Ltd., Toronto, Ont.
General Foreign Sales Office: Schenectady, N. Y.; 120 Broadway, New York City, 83 Cannon St., London, E. C., England.

43-14

MACK TRUCKS



CONTRACTING today is a combination of know-how and equipment. The extent and condition of a contractor's equipment are vitally important and both are carefully considered before a worthwhile contract is let. Motor trucks have come to play so important a part in the ability of a contractor to meet time limits that his fleet of motor trucks occupies the limelight.

Much credit for the success of motor truck equipment in contracting work must go to the International Motor Company of New York, manufacturers of Mack Trucks.

This company has not contented itself with manufacturing a strong, powerful, speedy, and economical truck. Special investigations have been made of all contracting work where a truck might be used to advantage. Then the transportation engineers of the International Motor Company designed bodies and planned external features which, added to the many other desirable qualities, made Mack Trucks best adapted for the work that they are intended to perform.

The Hydro Stone Products Company of Chicago, manufacturers of concrete blocks and large, heavy concrete slabs, was convinced that a Mack Truck was the one they wanted if the problem of loading the heavy material could be solved satisfactorily.

After a careful study of the situation the device illustrated was installed on a 5½-ton Mack chassis. The overhead track extends about 4 feet beyond the end of the truck's platform. With the standard chain hoist a load of two tons can be lifted and the truck can be loaded to capacity in three lifts.

During the month of July, 1917, the truck operated 1,675 miles. It hauled 366 tons, used only 11½ gal. of oil and 357 gal. of gasoline.

Contractors confronted with the problem of hauling marble, stone, and other heavy, bulky material will find a Mack Truck similarly equipped a most economical means of transportation.

In almost every city of any size Mack Trucks can be seen daily performing hauling jobs in connection with a large variety of contracting work. Mack Trucks are made in capacities of from 1 to 7½ tons, with trailers, to 15 tons. The International Motor Company, New York, will gladly send catalogs and complete information on request.

"Performance Counts"

INTERNATIONAL MOTOR COMPANY
NEW YORK

SEARCHLIGHT SECTION

PROPOSALS

Bids: July 23.

Canal Improvements

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS
Albany, N. Y., June 18th, 1918.

NOTICE TO CONTRACTORS:

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Tuesday, July 23rd, 1918, at which place and hour they will be publicly opened and read, for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and of the acts amendatory thereof and supplementary thereto, and Chapter 570 of the Laws of 1915, as follows:

1

CONTRACT NO. 168

Champlain Canal—Sections 1 and 2

For constructing concrete capped timber guide cribs near Locks 3, 5 and 6, Champlain canal.

Sheets 1 to 4, inclusive.

2

CONTRACT NO. 188

Erie Canal—Section 6

For completing the canal prism excavation at the N. Y. C. R. R. bridge, Brewerton.

Sheets 1 and 2.

And for the construction of Barge canal terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof, as follows:

3

TERMINAL CONTRACT NO. 109

For furnishing, testing and delivering electric capstans and trolley hoists at Pier 6, East River, and West 53rd Street Pier, New York City, and electric capstans at the Utica Terminal Lock.

No plans.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans of drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank (or trust company in the case of terminal contract) in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the state for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

W. W. WOTHERSPOON,
Superintendent of Public Works.

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a.m., for issue out the next morning.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the one nationally recognized medium for Proposal advertising, and its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

PROPOSALS

Bids: July 10.

Sewage-Treatment Plant and Pumping Stations

Bridgeport, Conn.

Sealed proposals for the construction of the Western Sewage Treatment Plant and Pumping Station, will be received at the office of the Paving and Sewer Commission, Room 22, City Hall, Bridgeport, Conn., until 2:30 o'clock, Wednesday, July 10, 1918, at which hour the bids will be publicly opened.

Envelopes containing proposals are to be marked "Proposals for the Construction of the Western Sewage Treatment Plant and Pumping Station, City of Bridgeport" and shall be addressed to the Paving and Sewer Commission.

Each bid must be accompanied by a certified check drawn to the order of the Treasurer of the City of Bridgeport in the amount of twenty-five thousand dollars, ($25,000.00); said check must be returned to the Bidder promptly upon the execution of the contract and furnishing a satisfactory bond by the successful Bidder.

The successful Bidder will be required to furnish a bond of an approved surety Company to the amount of 75 per cent. of the price bid for Item I for the faithful performance of the contract, and for the payment for all materials and labor used or employed in the execution of the contract in accordance with Chapter 118 of the Public Acts of 1917.

The successful Bidder will be required to execute the contract, and to furnish bond of approved surety within ten (10) days from the date of service of notice to the effect that the contract has been awarded, and in case of failure so to do, he shall be considered as having abandoned all rights to the award, and his check may be retained and kept and owned by the City as stipulated liquidated damages, for his failure to execute said contract with surety.

Bids must be made on the printed proposal blanks and must be expressed both in writing and in figures.

The right is reserved to reject any and all bids.

Copies of the City Drawings approved by the State Board of Health and Specifications now on file, proposal blanks, form of Bond and all other information for bidders may be had at the office of the City Engineer upon deposit of $50.00, which amount will be refunded if the plans and specifications are returned in good condition prior to the opening of the bids or in case a bid is submitted.

WILLIAM CHEW,
Chairman.
PAVING AND SEWER COMMISSION

PROPOSALS FOR LEVEE WORK.—Office of the Secretary, Mississippi River Commission, 1311 International Life Building, St. Louis, Mo.—Sealed proposals will be received here until 11 a. m., July 3, 1918, for constructing about 200,000 cubic yards of earthwork in the East Cape Girardeau and Clear Creek Drainage, District, Ill. Further information on application.

U. S. ENGINEER OFFICE, Cincinnati, O. Sealed proposals for horses, props, etc., will be received here until 2 p.m., July 23, 1918, and then opened. Information on application.

SEARCHLIGHT SECTION

PROPOSALS

Bids: July 3.

Highway Reconstruction

STATE OF RHODE ISLAND, STATE BOARD OF PUBLIC ROADS
Providence, R. I.

Sealed proposals for the reconstruction of a section of state highway 7230 feet in length, located upon the main road between Warren and Bristol will be received by the State Board of Public Roads at its office, Room 13, State House, Providence, R. I., until 12 M. on Wednesday, July 3, 1918, at which time they will be publicly opened and read.

The principal quantities involved are as follows:

Earth Excavation	5000 Cu.Yds.
Stone Foundation	1750 Cu.Yds.
Crushed Stone Base	3000 Tons
Bituminous Concrete Surface	14500 Sq.Yds.

Bids must be made upon blank forms to be furnished by the Board.

No bids will be received unless accompanied by a certified check for the sum of $200.00 payable to the State of Rhode Island.

The Board reserves the right to reject any and all bids and to give preference to towns or cities in accordance with Section 5 of Chapter 84 of the General Laws.

Plans may be examined and specifications and bidding blanks may be obtained at the office of the State Board of Public Roads, State House, Providence, R. I., on and after Thursday, June 20th, 1918, every week day (except holidays and Saturdays), between the hours of 9 a.m. and 5 p.m., Saturdays 9 a.m. to 12 m.

State Board of Public Roads.
ABRAM L. ATWOOD
JOHN F. RICHMOND
BENJAMIN F. ROBINSON
FRANK COLE
MICHAEL VAN BEUREN

Bids: July 2.

Paving

PENNSYLVANIA STATE HIGHWAY DEPARTMENT
Harrisburg, Pa.

Sealed proposals will be received at said office until 10 A.M., July 2, 1918, when bids will be publicly opened and scheduled and contracts awarded as soon thereafter as possible for the reconstruction of the following pavements: 5700 feet of Reinforced Concrete in Lebanon County; 7824 feet of Reinforced Concrete in Tioga County; 11,336 feet of Vitrified Block in Cambria County; 31,700 feet of Reinforced Concrete in Bradford County; 2430 feet of Reinforced Concrete in Clinton County; 28,891 feet of Reinforced Concrete in Northampton County; and 11,800 feet of Reinforced Concrete in Potter County. Bidding blanks and specifications may be obtained free, and plans upon payment of $2.50 per set, upon application to State Highway Department, Harrisburg. No refund for plans returned. They can also be seen at office of State Highway Department, Harrisburg, 1001 Chestnut Street, Philadelphia, and 904 Hartje Building, Pittsburgh.

J. D. O'NEIL,
State Highway Commissioner.

PROPOSALS

Bids: July 1.

Bridge Construction

STATE OF NEW YORK, OFFICE OF THE STATE COMMISSION OF HIGHWAYS
Albany, N. Y.

Pursuant to the provisions of Chapter 30, Laws of 1909, as amended, and Chapter 338, Laws of 1918, sealed proposals for the construction described below will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., until the first day of July at one o'clock P. M. and will at that time and place be publicly opened and read.

The bridge to be built is known as the "Chittenango Creek Bridge" on Highway No. 5120 at Chittenango, town of Sullivan, Madison County.

Proposals, plans, specifications and estimates may be obtained at the office of the Commission at Albany.

The proposed work consists of constructing a two-span reinforced concrete bridge, each span 30 feet long with a roadway 26 ft. wide and two walks 5 ft. wide. Necessary foundation work is also included.

The especial attention of bidders is called to the "NOTICE TO CONTRACTORS" attached to the specifications.

Proposals for this contract must be enclosed in envelope endorsed "Proposal for Building the Chittenango Creek Bridge." Each proposal must be accompanied by cash or a certified check payable to the order of the State Commission of Highways for an amount equal to at least five per cent of the amount of the proposal which such cash or check accompanies. Such cash or check will be held by the Commission until the contract and bonds are duly executed.

The successful bidder will be required to give a bond for fifty per cent of the amount of the contract. Such bond shall be executed by a surety company to be approved by the Commission or a bond secured by the deposit of collateral security to be approved by the Commission.

The right is reserved to reject any or all bids.

EDWIN DUFFEY,
Commissioner.

I. J. MORRIS,
Secretary.

Bids: July 10.

48-In. Reinforced-Concrete Conduit

CONTRACT 26
Hartford, Conn.

Sealed proposals, addressed to the Board of Water Commissioners of the City of Hartford, will be received at the Office of the Board, Municipal Building, Hartford, until 12 M., Wednesday, July 10, 1918, for the construction of a 48-inch reinforced concrete pressure conduit approximately 4800 feet long, built either in place or of precast pipe.

Plans and specifications may be obtained after June 29th, at the office of the Manager and Chief Engineer, on deposit of $5.00 which will be refunded on the return, in good condition, of both plans and specifications. Specifications used in making a bid will be considered as returned. Prior to June 29th, plans may be seen at the office of the Manager and Chief Engineer and the site of the work visited.

PROPOSALS

A certified check or cashier's check for $2500 must accompany each bid and the successful bid der will be required to furnish bonds in the sum of $60,000.

The right is reserved to reject any and all bids.

BOARD OF WATER COMMISSIONERS.
FRANK E. HOWARD,
President.
FRED D. BERRY,
Secretary.
CALEB MILLS SAVILLE,
Manager and Chief Engineer.
Pilgard Building, 1026 Main Street, Hartford, Conn.

Bids: July 11.

Paving

PENNSYLVANIA STATE HIGHWAY DEPARTMENT
Harrisburg, Pa.

Sealed proposals wil be received at said office until 10 A. M., July 11, 1918, when bids will be publicly opened and scheduled and contracts awarded as soon thereafter as possible for the reconstruction of the following pavements; 1269 linear feet of One Course Plain Cement Concrete in Blair County; 4983 linear feet of either Vitrified Block on a concrete base or One Course Plain Cement Concrete in Cambria County, 17,049 linear feet One Course Plain Cement Concrete and 2334 linear feet of either One Course Plain Cement Concrete or Bituminous Concrete and Hillside Vitrified Block on a Concrete Foundation in Chester County; 1842 linear feet of Vitrified Block in Clarion County; 15,918 linear feet of either One Course Plain Cement Concrete or Bituminous Concrete on a Concrete Foundation in Erie County; 13,881 linear feet of One Course Plain Cement Concrete in Mercer County; 18,083 linear feet of One Course Plain Cement Concrete and Hillside Vitrified Block on a Concrete Foundation in Greene County and for the grading and drainage of 3319 feet of roadway in Washington County. Bidding blanks and specifications may be obtained free and plans upon payment of $2.50 per set upon application to State Highway Department, Harrisburg. No refund for plans returned. They can also be seen at office of the State Highway Department, Harrisburg, 1001 Chestnut Street, Philadelphia, and 904 Hartje Building, Pittsburgh. J. D. O'Neil, State Highway Commissioner.

DEPARTMENT OF THE INTERIOR, Washington, June 17, 1918.—Sealed proposals, in duplicate, will be received at this Department until 2 o'clock P. M., Tuesday, July 2, 1918, and then opened, for the furnishing and erecting of boiler, the necessary piping, and stoker at Saint Elizabeths Hospital, Washington, D. C., in accordance with specifications, copies of which may be obtained upon application to the Chief Clerk of the Department. The right is reserved to reject any and all bids, or to accept or reject any part thereof in the discretion of the Secretary of the Interior. Proposals should be securely enveloped, marked "Proposal for boiler, piping and stoker, Saint Elizabeths Hospital," and be addressed to the Secretary of the Interior. S. G. HOPKINS, Assistant Secretary.

PROPOSALS FOR CADET LAUNDRY.—Office Quartermaster, West Point, N. Y.—Sealed proposals will be received here until 12 M., July 5, 1918, and then opened, for construction of Cadet Laundry. Information on application.

SEARCHLIGHT SECTION

PROPOSALS

Bids: July 11.

State Highway Improvement

STATE OF NEW JERSEY, STATE HIGHWAY COMMISSION

Trenton, N. J.

Notice is hereby given that sealed bids will be received by the State Highway Commission of New Jersey, for the improvement of State Highway Route No. 4, Section No. 1, in the County of Monmouth, with a Portland Cement Concrete surface. Bids will be opened and read in public at the office of the State Highway Commission, Broad Street Bank Building, Trenton, N. J., on Wednesday, July 10, 1918, at 10:30 A.M. Estimated amount of surface pavement required is 37,000 square yards. The proposed work is located between Red Bank and Middletown.

Drawings, specifications and forms of bid, contract and bond, for the proposed work, are on file in the office of the said Department, at Trenton, N. J., and may be inspected by, or furnished on deposit of Ten Dollars ($10) to prospective bidders. Bids must be made on the standard proposal forms, in the manner designated therein and as required by the specifications, same to be enclosed in sealed envelopes, bearing the name and address of bidder and name of the road on the outside, addressed to State Highway Commission, Broad St. Bank Bldg., Trenton, New Jersey, and must be accompanied by a certified check for not less than ten per cent. (10%) of the amount of the bid, and be delivered at the place and on or before the hour named. Copies of standard proposal form will be furnished on application.

Each bidder must accompany his bid with a certificate from a surety company, duly authorized to do business in this State, stating that such surety company will provide said bidder with a bond in such sum as is required in, and in accordance with the provisions of said specifications, conditioned for the faithful performance of the provisions of the contract and specifications.

By order of the State Highway Commission.

A. LEE GROVER,
Chief Clerk.

Bids: July 17.

Plumbing, Sewering, Etc.

Fargo, N. D.

Sealed proposals will be received by the Board of Education, Fargo, No. Dakota, July 17th, 1918, at 2 o'clock, P.M., for the following work on the new High School building now being erected at Fargo. The general work and electric work for said building having already been let.

Plumbing, Sewering and Gas Fitting.
Heating and Ventilating.

The above work to be done from the plans and under the supervision of Wm. B. Ittner, Architect.

Make application for plans and specifications to Wm. B. Ittner, Architect, Board of Education Building, St. Louis, Mo. Local bidders can secure same from the Board of Education at Fargo. A deposit of twenty dollars is required covering the plans for each letting, which will be refunded on return of same.

By order of the
BOARD OF EDUCATION, FARGO, N. D.

PROPOSALS

Bids: August 15.

State Roads

NEW MEXICO STATE HIGHWAY COMMISSION

Santa Fe, N. M., June 15, 1918.

Sealed proposals will be received at the office of the New Mexico State Highway Commission, Capitol Building, Santa Fe, New Mexico, until 2:00 o'clock P. M. August 15, 1918, for the construction of approximately three miles of State Road No. 3, Quay County, Section No. 2, as designated on the map of the State Highway System, said work being between San Jon and Tucumcari about eighteen miles from Tucumcari, New Mexico.

1267.11 cu. yds. grader cut clay, loam and sand
1911.41 cu. yds. grader fill clay, loam and sand
3373.10 cu. yds. borrow clay, loam and sand
3478.89 cu. yds. cut clay, loam and sand
701.00 cu. yds. cut loose shale
1529.81 cu. yds. cut sandstone
25.7 cu. yds. 1:2½:5 concrete headwalls
4888.87 cu. yds. gravel surfacing
100821 yard stations overhaul
63 lin. ft. 18" corrugated iron pipe
83 lin. ft. 24" corrugated iron pipe
44 lin. ft. 36" corrugated iron pipe

Forms for proposals, instructions to bidders, plans and specifications may be examined at the office of the State Highway Engineer or may be had upon application to the State Highway Engineer upon deposit of ten dollars for same, which deposit will be refunded upon the return of the plans and specifications.

The right is reserved by the State Highway Commission to reject any and all proposals.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., June 15, 1918.—Sealed proposals will be opened at this office at 3 p.m., July 18, 1918, for the construction of the United States post office at Eldorado, Kans. Drawings and specifications may be obtained from the custodian of the site at Eldorado, Kans., or at this office, in the discretion of the Supervising Architect. Jas. A. Wetmore, Acting Supervising Architect.

LOCKKEEPERS' HOUSES.—U. S. Engineer Office, Wheeling, W. Va.—Sealed proposals will be received here until 11 a.m. (Eastern time), July 25, 1918, and then opened, for constructing two two-story twelve-room lockkeepers' houses at Dam No. 27, Ohio River. Information on application.

OFFICE OF THE COMMISSIONERS OF THE DISTRICT OF COLUMBIA, Washington, D. C., June 19, 1918. Sealed proposals will be received at this office, Room 511, District Building, until 2 o'clock P.M., June 28, 1918, and then opened, for the purchase of tankage, recovered from garbage, collected by the Commissioners, D. C., from July 1, 1918, to and including December 31, 1918. Blank forms of Proposals, Specifications, together with necessary information, may be obtained form the Chief Clerk of the Engineer Department, Room 427, District Building. Louis Brownlow, John G. D. Knight, W. Gwynn Gardiner, Commissioners, D. C.

UNITED STATES ENGINEER OFFICE, Room 1108, South Ferry Building, 44 Whitehall Street, New York, N. Y.—Sealed proposals for dredging and rock removal in Hudson River, N. Y., will be received here until 12 m., July 5, 1918, and then opened. Further information on application.

PROPOSALS

Bids: July 10.

Sewer System and Disposal Works

Dearborn, Michigan.

Sealed proposals will be received at the office of the Village Clerk, Dearborn, Michigan, up to eight P.M. Wednesday, July 10th, 1918, for furnishing material and constructing a system of sewers of about 66,000 feet of pipe ranging from 8 inches to 24 inches in diameter, together with manholes, sewage treatment works and pumping stations.

The work has been divided into five sewer districts and disposal works. Separate bids will be entertained on each of these items and each proposal must be made upon the printed form attached to specifications.

Each and every bid must be accompanied by a certified check payable to the Village of Dearborn and certified to by a responsible bank for an amount of five per cent. (5%) of the sum of the bid. All certificates accompanying rejected proposals will be returned. Should any proposal be accepted, the party or parties making the same shall execute a contract and furnish the required surety bond satisfactory to the Village of Dearborn, within ten days after receiving notice; or, failing so to do, the certificate of deposit accompanying the proposal shall be forfeited to the said Village of Dearborn.

The bids shall be in acordance with the plans and specifications for the work on file at the office of the Village Clerk, Dearborn, Michigan, and at the office of Clarence W. Hubbell, Consulting Engineer, Detroit, Michigan, from whom copies may be obtained by making a deposit of Ten Dollars ($10.00), which amount will be refunded upon return of the plans and specifications on or before July 20th, 1918.

The Village reserves the right to reject any part of the proposal, or any or all proposals.

FRED C. REAMER,
Village Clerk.

Contract Work to Sublet

To sub-let in the vicinity of Buffalo, N. Y.
3500 cu. yd. excavation
500 cu. yd. 2nd class reinforced concrete.

W. F. MARTENS,
245 Cutler Bldg.,
Rochester, N. Y.

PROPOSALS FOR LEVEE WORK.—Office of the Secretary, Mississippi River Commission, 1311 International Life Building, St. Louis, Mo.—Sealed proposals will be received here until 11 a.m., July 3, 1918, for constructing about 225,000 cubic yards of earthwork (105,000 cubic yards new levee; and 120,000 cubic yards levee enlargement) in the Hunt Drainage District, Ill. Further information on application.

UNITED STATES ENGINEER OFFICE, Room 1131, South Ferry Building, 44 Whitehall Street, New York City. Sealed proposals will be received here until 12 m., June 29, 1918, and then opened, for dredging in San Juan Harbor, P. R., and filling of adjacent swamp lands. Further information on application.

PROPOSALS FOR JETTY REPAIRS. U. S. Engineer Office, Old Federal Building, Wilmington, Del. Sealed proposals for repairs to jetty at mouth of Broadkill River, Del., will be received here until 11 A.M., July 19, 1918, and then opened. Further information on application.

SEARCHLIGHT SECTION

PROPOSALS

Bids: July 9.

Sanitary Sewer Main

Johnstown, Pa.

Sealed proposals will be received at the Office of the Superintendent of Streets and Public Improvements, City Hall, Johnstown, Pa., until 12:00 o'clock noon, on Tuesday, July 9, 1918, for the construction of Section No. 3, Sanitary Sewer Main and its appurtenances; from Hagen Street, in the 21st Ward to 10th Avenue in 16th Ward, City of Johnstown, in accordance with plans and specifications on file in the office of the City Engineer; comprising approximately

1650 Lineal Feet	63"	R. C. P.
2339 Lineal Feet	60"	R. C. P.
2592 Lineal Feet	8"	T. C. P.
1100 Lineal Feet	6"	T. C. P.
30 Lineal Feet	18"	T. C. P.
38 Lineal Feet	12"	T. C. P.
12 Manholes		

Conemaugh River Siphon, 2 siphon chambers, two lines 39" R. C. P. each 350' Lineal and Emeregency outlet Chamber.

Plans, specifications and blank proposal can be obtained at the Office of the City Engineer on payment of twenty dollars ($20.00) which will be refunded upon the day of the letting to those submitting bids, providing the plans and specifications are returned in good condition.

Proposals shall be made on the blank forms attached to the specifications and must be accompanied by a bond in the sum of Eight Thousand ($8000.00) Dollars or a certified check for a like amount on a solvent bank, doing business in the City of Johnstown, Pa., and made payable without reservation to the order of the Treasurer of the City of Johnstown as a guarantee that, if the proposal be accepted, a contract will be entered into.

The right is reserved to reject any or all bids or to waive irregularities in bids if it is deemed to be to the interest of the city to do so. M. LEE MASTERTON,
Supt. of Streets and Public Improvements.

Bids: July 11.

Water Mains

Ann Arbor, Michigan.

Sealed proposals will be received by the Water Works Department of the City of Ann Arbor, Michigan, at the office of Geo. S. Vandawarker, Manager, until 2 o'clock P. M., Central Standard time, Thursday, July 11, 1918, for laying with valves and special castings appurtenant thereto, approximately 18,000 feet of 20-inch cast iron water main.

A certified check for a sum not less than five per cent of the estimated amount of the proposal will be required.

Information for bidders, form of proposal and contract, plans and specifications, may be examined at the offices of the undersigned or may be obtained from Holland, Ackerman & Holland, Consulting Engineers, Lawrence, Building, Ann Arbor, Michigan upon the deposit of ten dollars, which will be refunded upon their return.

The Water Works Department reserves the right to reject any or all bids and to waive defects in form.

WATER WORKS DEPARTMENT,
GEO. S. VANDAWARKER, Manager.
HOLLAND, ACKERMAN & HOLLAND,
Consulting Engineers.

PROPOSALS

Bids: July 3.

Concrete Mixer

Ann Arbor, Mich.

Sealed proposals will be received at the City Clerk's office, Ann Arbor, Mich., until 7:30 o'clock p.m., Wednesday, July 3, 1918, for a 5 cu.ft. capacity concrete batch mixer with loader attached. The Board reserves the right to reject any and all bids.

By order of the Board of Public Works.
ISAAC G. REYNOLDS,
City Clerk.

DEPARTMENT OF THE INTERIOR, UNITED STATES RECLAMATION SERVICE, Washington, D. C., June 24, 1918.—Sealed proposals for the construction of laterals on the Rio Grande Project, involving about 27,700 cubic yards of excavation will be received at the office of the United States Reclamation Service, El Paso, Texas, until 2 o'clock p.m., August 1, 1918, and will at that hour be opened. The work is located near El Paso, Texas.

For particulars address the United States Reclamation Service, El Paso, Texas; Denver, Colorado, or Washington, D. C. Morris Bien, Acting Director.

PROPOSALS FOR STONE.—U. S. Engineer Office, Customhouse, New Orleans, La.—Sealed proposals will be received here until 11 a.m., July 12, 1918, and then opened, for furnishing and delivering stone for Head of Passes and Southwest Pass, Mississippi River. Information on application.

PROPOSALS FOR WILLOWS AND POLES.—U. S. Engineer Office, Customhouse, New Orleans, La.—Sealed proposals will be received here until 11 a.m. July 12, 1918, and then opened, for furnishing and delivering willows and poles for South and Southwest Passes, Mississippi River and Plaquemine, La. Information on application.

Bids: July 9.

Get your copy in early—

Owing to the holiday next week, the forms for the Searchlight Section of the

July 4th issue

of

ENGINEERING NEWS-RECORD

will close for press Monday, night, July first.

POSITIONS VACANT

DRAFTSMEN for right of way and track maps and profiles in connection with Federal Valuation. State age, nationality, experience, reference and salary expected. Also submitting sample of work. Will send transportation. E. F. Collins, Valuation Engineer, St. L.S.F., Railway Company, St. Louis, Missouri.

DRAFTSMEN wanted on mechanical and structural detail. State salary, experience, nationality and when available. Steady position for competent men with live chance for advancement. Address Box 386, Iola, Kan.

POSITIONS VACANT

DETAILERS and checker on structural steel, permanent position. State age, experience and salary expected. Lake side Bridge & Steel Co., North Milwaukee, Wis.

ENGINEER, capable of taking charge of repairs and maintenance, involving supervision of all mechanical trade, large industrial firm in Philadelphia; should be mechanical engineer, technical graduate and good organizer, with several years' experience; permanent position; best of opportunities. P-991, Eng. News-Record, Philadelphia.

WANTED for structural steel fabricating shop in Havana, competent draftsman, experienced making shop detail plans for mill building work. State age, nationality, experience, salary desired, date could start, transportation paid. P-964, Eng. News-Record.

MECHANICAL draftsmen, checkers, detailers, tracers. Reply, stating education and experience in detail, age, present employer, salary expected, when available and relation to draft. P-960, Eng. News-Record, Philadelphia.

DRAFTSMEN (Hull) wanted for the Panama Canal. One vacancy at $175 a month, one vacancy at $200 a month, to be increased to $225 a month after three months' satisfactory service. Must be thoroughly experienced on hull work. Must be American citizens (final papers) under 50 years of age, in good health. Free steamship transportation furnished from New York or New Orleans, salary beginning date of sailing. Write Chief of Office, The Panama Canal, Washington, D. C.

DRAFTSMEN wanted, mechanical and tracers. Apply Charles B. Buerger, Chief Engineer, Atlantic Refining Co., 3144 Passyunk Ave., Philadelphia, Pa.

STRUCTURAL draftsmen; experienced in shop details for bridges, buildings and other steel structures. Give age, experience, nationality, salary expected and when report. P-956, Eng. News-Record, Philadelphia.

EXPERIENCED railroad engineers wanted for valuation work. Instrumentmen, recorders, computers, etc. Salaries $100 to $140. P-953, Eng. News-Record, Chicago.

ENGINEER—Resident engineer on design and construction of water and sewerage systems, embracing approximately 12 miles of lines and disposal plant. Applicant will state age, give experience and references. Salary $150.00 per month. Address Box 416 La Grange, Ga.

WANTED thoroughly experienced highway bridge and structural engineer for detailing. Applicant must be beyond draft age. State age, salary wanted, experience and furnish reference. Clinton Bridge Works, Clinton, Iowa.

METAL working concern with rapidly expanding business, desires man to take charge of planning department. One with technical knowledge preferred. Location central New England. P-977, Eng. News-Record.

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100 Draftsmen wanted; topographical, mechanical, structural, architectural. To serve their country in the practice of their profession; work on mapping and designing of large Government industrial plant in New York, South and West. P-26, Eng. News-Record.

ENGINEERS wanted; civil, mechanical, electrical and chemical, for mapping, designing, constructing and operating a large Government plant. Here is an opportunity for married men, who cannot go to France, to serve their country while practicing their profession. P-25, Eng. News-Record.

SEARCHLIGHT SECTION

POSITIONS VACANT

GEODETIC. Hydrographic and magnetic computers wanted. United States Coast and Geodetic Survey is holding a continuing examination for the position of computer in the geodetic, hydrographic, and magnetic work of the U. S. Coast and Geodetic Survey. The examination is a regular one and candidates are graded according to the ratings made in college work, or on general education and experience after graduation. The prerequisite is three years of civil engineering course or graduation in some other course at an institution of learning of recognized standing. The work is at Washington, D. C., entrance salary, $1,200 per year. Chances of appointment are excellent. Detailed information will be sent upon application to the Civil Service Commission or the Coast and Geodetic Survey, Washington, D. C.

ENGINEERING draftsman wanted; familiar with reinforced concrete, structural steel, steam power plant and general refinery experience. Apply by letter to J. J. Allinson, Chief Engineer, Empire Refining Co., Drawer F, Bartlesville, Okla. Stating age, experience and salary.

TOPOGRAPHICAL draftsman wanted, New York City. Salary $105 to $120. Send sample and references. P-25, Eng. News-Record.

INSTRUMENT men and inspectors for sewer work in Iowa. $150.00 per month. Iowa Engineering Co., Clinton, Iowa.

INSTRUMENT man wanted; drainage construction work, southeast Missouri. Apply, naming references and salary wanted to Wm. A. O'Brien, Chief Engineer, Little River Drainage District, Cape Girardeau, Missouri.

ENGINEER and Cost Accountant—Experienced man capable of developing Unit Costs from records of Railroad Engineering and Accounting Records. Salary $160 to $175. Address Valuation Engineer, 547 W. Jackson Blvd., Chicago.

ESTIMATORS on general construction at once. Only experienced men need apply. The Quantity Survey Co., 21 West 45th St., New York City.

ENGINEER and estimator, with experience in industrial car work preferred. Give full particulars. Address Post Office Drawer 1399, Columbus, Ohio.

DESIGNER and detailer on reinforced concrete building work wanted. Technical graduate preferred. Location Boston. Give experience, references, nationality and salary desired. P-9, Eng. News-Record.

ENGINEER—Have position for assistant Highway Engineer whose duties will be chiefly field work. Some drafting and computation in office. Salary $125.00 per month. Wire or write N. C. Hughes, Jr., Engr., Cherokee County Highway Commission, Gaffney, S. C.

INSTRUCTORS and research assistants wanted. The College of Engineering of the University of Illinois has a number of vacancies in its teaching and scientific staffs. At present instructors in architectural design, general engineering drawing, structural engineering and mechanical engineering and engineering experiment station research assistants in electrical engineering and in mechanical engineering are needed. Applicants for any of these positions should send a full statement of their professional training and experience, a recent photograph and a list of references to Dean C. R. Richards, College of Engineering, University of Illinois, Urbana, Illinois.

INSPECTORS wanted for concrete road work in West Virginia. Salary $100 to $150 per month, depending on experience and qualifications. Transportation paid to job. State age, education, experience and salary, present and desired. P-53, Eng. News-Record, Phila.

POSITIONS VACANT

STEEL detailer wanted immediately and checker experienced in grain elevator work. Excellent permanent position right man. Apply Fegles Bellows Engineering Co., Fort William, Ontario.

LARGE corporation has several openings in purchasing department for young men 25 to 30 years of age who are willing to start at moderate salary and have had suitable training in this field; those with engineering training or knowledge preferred. The position presents manifold opportunities to right men. Apply by letter, stating age, training, experience, salary expected and draft classification. P-75, Eng. News-Record.

TWO mechanical draftsmen wanted. Must be neat tracers and letterers; location downtown. Apply Chief Engineer, Room 1206, 25 Broad Street, N. Y. C.

POSITIONS VACANT

FIELD ENGINEER wanted, also rodmen for industrial plant construction in northern Ohio. In answering please give age, education, experience, salary expected and how soon able to report, also standing in draft. Address replies to Construction Department, Box "Q," Bayonne, N. J.

RESIDENT Engineer wanted for Southeast trunk line railroad, salary $131.00 a month. Give full particulars in first letter, P-43, Eng. News-Record, Phila.

FOR engineering and contracting company specializing in reinforced concrete construction, the services of an engineer thoroughly experienced and capable of taking charge of engineering department; state salary. P-62, Eng. News-Record.

PROGRESS

War cannot wait for fads, factions and inaction among engineers. Neither can industry and reconstruction wait after the war. Unified engineering service is and will be demanded.

There are 200,000 men of engineering experience in the United States. 50,000 support engineering societies. 150,000 more should do so.

SUCCESS

The nation demands your technical service.

Engineering society membership means opportunity. It provides for the interchange of information beneficial to members, the maintenance of a service clearing house; the guidance of legislation affecting affairs of vital interest to the profession; the fostering of a fraternal spirit among engineers; and above all, the publication and promotion of engineering ideals.

Individual opportunity for service depends upon concerted action made possible by all technical men being included in one comprehensive organization.

Where do you stand? Are you looking ahead?

For progress—Join now!

For success—Do your part!

AMERICAN ASSOCIATION OF ENGINEERS

Representatives in all cities

Chapters and Clubs in the Principal Cities

American Association of Engineers,
National Headquarters, 29 S. La Salle St., Chicago, Ill.

Please send me blanks. It took me.....minutes to decide.

Address .....

Name .....

SEARCHLIGHT SECTION

POSITIONS VACANT

PATENT Draftsman capable of making first-class drawings of machinery and of assisting patent attorney. Opportunity for one with ambition and ability. Address Patent Attorney, Norton Company, Worcester, Mass.

EMPLOYMENT AGENCIES

BE A DRAFTSMAN—Pleasant work; salary $100 to $200 a month. Study at home in spare time; we will help you secure position when qualified. Send today for particulars and liberal offer. Drawing outfit free to every student. Columbia School of drafting, 234 McLachlen Bldg., Washington, D. C.

CORRESPONDENCE SERVICE

THE undersigned provides a confidential service designed to locave openings through correspondence, for men earning not less than $2500 and up to $25,000; all lines. Not an employment agency, but a constructive, initiative service, covering individual negotiations. Established 1910. Complete privacy assured; present connections in no way jeopardized. Send name and address only for explanatory details. R. W. Bixby, T64-66 Niagara Street, Buffalo, N. Y.

POSITIONS WANTED

Mechanical and Electrical

ENGINEER, mechanical; college graduate, eight years experience in railroad shops, pumps; mill buildings; railroad cars and valuation of mechanical equipment of railroads. Design, test and inspection. Will accept responsible position. PW-36, Eng. News-Record

MECHANICAL engineer, graduate of mechanical engineering college of Russia, former member of Russian Artillery Commission in America, wishes position in machinery manufacturing plant where his services and experience will be of value; best of references. PW-71, Eng. News-Record.

MECHANICAL engineer, technical graduate, experienced in design and maintenance cars, locomotives, special machinery, structures, test apparatus, now with Eastern railroad, desires to locate with concern offering opportunity to demonstrate ability and receive advancement. PW-61, Eng. News-Record.

TECHNICAL graduate (electrical) with five years' experience in operating, engineering and familiar with construction and operation of high power electric furnaces wishes position on operating staff of manufacturing corporation. PW-67, Eng. News-Record, Chicago.

CIVIL and mechanical engineer; graduate; age 38; twelve years' experience as chief draftsman for design and superintendent of construction for steel and concrete bridges, buildings and industrial plant layouts, open for position of responsibility. PW-68, Chicago.

MECHANICAL industrial engineer, practical and technical education; aged 40; married; employed; American citizen; specialized in design, construction and rearrangement of cement and paper mills, coal and oil by-products, recovery plants, steel, ammunition and furnace work, fuel economy; successful designer of special machinery; good organizer and systematizer; economical buyer; desires permanent connection as designing, production or research engineer; salary according to position offered. PW-63, Eng. News-Record, Philadelphia.

WANTED

COMPETENT ELECTRICIAN

to act as assistant to electrical engineer in a large manufacturing company operating hydroelectric plant of 100,000 hp. capacity and building additional plant of approximately 30,000 hp. Applicants must understand thoroughly the operation of rotary converters and be efficient in overseeing motor repairs.

In filing applications, it will be necessary to state salary expected and give references from employers during past ten years.

Location of prospective employment —North Carolina.

P 49—Eng. News-Record
935 Real Estate Trust Bldg., Philadelphia

WANTED

Structural Detailers and Checkers

Excellent opportunities for good men, Location, New York State

P 12, Engineering News-Record
10th Ave. at 36th St., New York

WANTED DESIGNERS OF CONCRETE AND STEEL

YOU Can Fill That Need

Special Courses of Home Study have been arranged by well-known Engineer with 30 years' experience.

Designers of Steel and Concrete are scarce, the country needs trained men and needs them quick. These courses give actual experience in designing and estimating the cost of Steel and Concrete Structures in the shortest possible time. An opportunity for the ambitious man to get ahead. Also a course in Structural Drafting. *Write today for information.*

M 1006—Eng. News-Record,
10th Ave. at 36th St., New York, N. Y.

DRAFTSMAN

WANTED

Apply
HENRY SMITH & SONS COMPANY
7 E. German Street, Baltimore, Md.

Additional Positions Vacant Ads on page 85

POSITIONS WANTED

MECHANICAL engineer, 4 years' experience including machine shop designing seeks position with advancement, at present employed. PW-39, Eng. News-Record.

Civil Engineers

ENGINEER, highway designs, estimates, surveys, etc., present salary $150 per month. Desires change. PW-986, Eng. News-Record.

ENGINEER; technical graduate, 5 years railroad location and construction; 1 year industrial; married; class 4 in draft; available immediately; references. PW-924, Eng. News-Record, Cleveland.

ENGINEER with broad experience as designer, sales engineer and manufacturers' representative in structural lines. Specialist in fireproofing and reinforced concrete work. Desires to make change. East preferred. Address PW-938, Eng. News-Record, Cleveland.

YOUR Explosive Problem—Engineer specialist in the use of Explosives in Quarrys, Shaft and Tunnel work also Coal and Metal mines. I solicit a connection with a user of explosives who is interested in the reduction of cost, the increase of production and the installation of safety measures. Adress Suite B-3 Amsterdam Apartments, Atlantic City, New Jersey.

CONTRACTOR'S manager, chief engineer or chief estimator; technical graduate; age 36; Assoc. M. Am. Soc. C. E.; twelve years construction costs and methods; also reinforced concrete design; salary $300; present position managerial. PW-70, Eng. News-Record, Chicago.

CIVIL engineer, Assoc. M. Am. Soc. C. E. Ten years in responsible charge of public works abroad—location, design, estimates and construction including highways, buildings, harbor works, irrigation and drainage projects. Now open for engagement. Home or abroad. Salary $4500. References. PW-7, Eng. News-Record.

CIVIL engineer (27) six years varied experience; construction, surveys, drafting. Desires outdoor position; war work in Eastern locality preferred. Have deferred classification. PW-6, Eng. News-Record.

COMBUSTION engineer, graduate mechanical engineer with ten years' experience in the economical use of anthracite and bituminous coal in manufacturing power plants. Capable of taking charge of the buying and consumption of fuel for a company operating several plants which consume a large tonnage. PW-17, Eng. News-Record, Philadelphia.

ELECTRIC railway engineer, 31, successful experience in charge of construction M. of W. and electrical matters, desires employment with public utility contractor or engineer. References. PW-950, Eng. News-Record.

SEARCHLIGHT SECTION

POSITIONS WANTED

ENGINEER—Young engineer, 24, exempt from draft on account of slight physical defect; experience in drafting, surveying and reinforced concrete design, desires position in New York City only. PW-57, Eng. News-Record, Cleveland.

GRADUATE civil engineer; nine years' experience; six years designing and supervising the construction of fixtures and equipment. PW-58, Eng. News-Record.

CIVIL engineer; technical graduate; 38; married; 14 years' varied experience, including railroad, municipal highway and land survey; minimum salary, $200. PW-59, Eng. News-Record, Philadelphia.

CIVIL engineering student about to graduate desires any position in civil engineering; A1 references; expert mathematician; salary $75 per month; draft status 2B. PW-78, Eng. News-Record.

CIVIL Engineer, age 34; technical education, ten years' experience in construction of heavy foundations, sewers, mill buildings, railroads, reinforced concrete and other work. Six years civil engineer in steel plant. Desires position in charge of construction department of steel plant or other industrial concern. PW-45, Eng. News-Record, Cleveland.

CIVIL engineer; technical graduate; draft, class 4; structural steel designing and detailing six years, surveying two summers, some concrete experience, desires position as assistant engineer for industrial plant, Buffalo preferred. PW-64, Eng. News-Record.

POSITION WANTED

I am 33, married, trained civil engineer. Six years' contracting for and constructing pavements, highways, concrete structures, sewers. Closing up last contract this month. Will discontinue for the war. My experience is worth $3000 per year to you if you need me. Have machinery, cash and credit, but prefer to sell my services. For interview, address

PW 40—Eng. News-Record
10th Ave. at 36th St., New York

WANTED

A Contractor Who Needs My Services

Have had 15 years' experience in responsible charge of construction work—on Locks, Dams, Intakes, Pumping Plants, Dredging, Bridge Piers, Open and Pneumatic Caissons, and difficult foundation work in tin plate plant, blast furnaces and industrial plants. Am prepared to work in this country or abroad.

PW55—Eng. News-Record
935 Real Estate Trust Bldg., Phila., Pa.

POSITIONS WANTED

BUILDING engineer with 20 years' experience designing, detailing, writing specifications, making bill of materials, estimating and supervising the construction of all kinds of railway buildings, is open for a responsible position; minimum salary, $2,400. PW-72, Eng. News-Record, Chicago.

PROFESSORSHIP or instructorship in civil engineering, mathematics or mechanics desired by graduate engineer, two degrees; eight years' practical experience highway, railroad and municipal engineering; capable teacher; location immaterial. PW-73, Eng. News-Record, Philadelphia.

CIVIL engineer, graduate; experienced in field, office, drafting room, timber, steel, reinforced concrete design and construction; sewers, power plant, hydroelectric, subways, industrial plants, docks; salary $200 per month. PW-74, Eng. News-Record.

MUNICIPAL engineer, eight years' experience, four as city engineer, city of 25,000; now handling municipal end of consulting practice; C. E. degree Purdue University; class 4 draft; salary, $175. Engineer, 758 Fifty-second Street, Milwaukee, Wis.

CORRESPONDENCE school graduate desires architectural or civil engineering work with chance to gain field and office experience; will serve apprenticeship. PW-69, Eng. News-Record, Chicago.

COST engineer; thoroughly experienced engineer and cost accountant, especially on construction work, wants position. PW-79, Eng. News-Record, Philadelphia.

CIVIL engineer; technical graduate; 2½ years construction and steel drafting. Married, class 4 in draft, desires designing and structural steel drafting position in or near New York. PW-52, Eng. News-Record.

Bridge and Structural

STRUCTURAL steel engineer designer and estimator; technical graduate; 12 years' experience in field shop and office with engineers and structural contractors on bridges and industrial plants. PW-939, Eng. News-Record, Philadelphia.

ENGINEER AND ESTIMATOR: 9 years in charge of structural and ornamental iron works, designs, details, executive. PW-10, Eng. News-Record.

STRUCTURAL executive and office manager. Technical graduate. 9 years design, seven years supervising design and organization. Wants hard interesting work in above or allied lines near New York City. Salary $250 per month if proposition offers good future possibilities. PW-910, Eng. News-Record.

ENGINEER, B. S. in C. E. Member Western Society of Engineers. 10 years' experience, past seven years in charge design and construction heavy structures, steel, reinforced concrete, timber. Wishes to assist in war work, preferably on construction. PW-973, Eng. News-Record, Chicago.

ENGINEER—Construction, costs, etc. Experienced in estimates, valuation and finances. Has had charge field and office staffs. $3000. PW-42, Engineering News-Record, Chicago.

ENGINEER, mechanical and structural, 42; university graduate; 22 years' experience as chief engineer, chief draftsman, designer of steam engines, condensers, pumps, boilers, power transmissions, automatic machinery, industrial and power plants; six years bridges and structures, present employment; inventive and original; desires responsible position. PW-66, Eng. News-Record.

POSITIONS WANTED

Draftsman

DRAFTSMAN—Special track work draftsman; 20 years' experience, will work cheap. Address PW-931, Eng. News-Record.

RAILWAY and map draftsman (33) wants position on or in charge of map work, etc., in real estate or chief engineer's department of railroad, coal or industrial company; will consider valuation or field drafting to start; south of tropics preferred. PW-76, Eng. News-Record, Cleveland.

Surveyors

SURVEYING party with equipment and auto. Available for work near New York City. Long Island preferred. Fifteen years' experience. Address Engineer, Box 6, Elmhurst, New York City.

Superintendent

SUPERINTENDENT of construction; first-class executive, broad experience; difficult foundations, locks, dams, bridges, building and industrial plant construction; concrete a specialty PW1001—Eng. News-Record.

FOREMAN—Wanted position as general foreman; have experience in excavating deep foundation, timber work, concrete and carpenter work. Go anywhere. PW-932, Eng. News-Record.

MARRIED man 25 years of age; as assistant superintendent on general construction work. Desire to give present employer one month notice. Will go anywhere. Good education. Can produce results. PW-21, Eng. News-Record, Philadelphia.

SUPERINTENDENT of construction. American, thoroughly experienced in general contracting, estimating costs, handling men, construction of water works, sewers, conduits, roads, pavements, reinforced concrete, etc. Accurate, industrious, reliable, highest of references. PW-16, Eng. News-Record.

BUILDING superintendent and engineer desires to make change; 17 years' experience as field engineer and superintendent on steel, concrete and industrial buildings; age 39. PW-65, Eng. News-Record, Cleveland.

SUPERINTENDENT of underground construction; 34 years old; first class executive; broad experience in the building of sewers and laying of gas and water mains; have been in the general contracting business for past six years. John McCool, 119 West Pomona Street, Germantown, Philadelphia.

SUPERINTENDENT-Estimator—15 years' experience, American, 34, thorough knowledge of building construction, purchasing, handling of sub-contractors, reinforced concrete, masonry, carpentry, plumbing. Initiative, ability, push. Moderate salary to prove worth. Box 135, Haworth, New Jersey.

FILTRATION Superintendent, Chemist, Bacteriologist Graduate seven years' experience mechanical filtration. Open July 1. PW-46, Eng. News-Record.

SUPERINTENDENT of construction, graduate engineer, 32, married, 9 years' experience in heavy steel and reinforced concrete construction, in responsible charge away from home office. Hard worker with initiative, and ability to handle men, available now. Care L. Anderson, Box 13, Florence, Minnesota.

SUPERINTENDENT, Electrification. 20 years' experience. Original in ideas and know how to handle work expeditiously with mechy. Salary $400. Best references. PW-51, Eng. News-Record, Phila.

SEARCHLIGHT SECTION

POSITIONS WANTED

Miscellaneous

ARCHITECT—First-class structural architect, 30 years' experience, wants permanent position to take entire charge. General experience in large work, also specifications and supervision. Age 48. Best reference. Address F. G. K., 21 West 25th St., Baltimore, Md.

I WANT an executive position in your construction department; fully qualified to take complete charge; interview in New York after July 1; salary, $3,000. PW-56, Eng. News-Record.

AGENTS AND SALESMEN

Sales Engineers Wanted

A leading manufacturing concern has openings for salesmen for power plant and engineering equipment, engines, pumps, air compressors, condensers, etc. Must be draft exempt or in Class Four. Give full details, age, education, experience, reference and salary. AS-8, Eng. News-Record.

Young Man Wanted

with engineering training, to sell steam and street railway track work. State salary expected and all details in first letter. AS-11, Eng. News-Record, Chicago.

EVENING WORK

Work Wanted

My 3 draftsmen available for spare time on civil engineering drawings. Trained for best workmanship. Address C. E. Box 6, Elmhurst, New York City.

WANTED

Drafting Wanted

We take it away and return it completed. map drafting, notes reduced, plotted and map completed. Estimates, computing, architectual draughting, tracings, expert lettering. Fifteen years' experience. If you have a job you need quick, address W-44, Eng. News-Record.

PATENT ATTORNEYS

IMPROVEMENTS wanted. Send for free Bulletins listing manufacturers wants and book "Inventions, Patenting and Promoting." Lancaster & Allwine, 272 Ouray Building, Washington, D. C.

FOR SALE

Engineering Business

In city of 35,000, owner entering government service; has been established for 20 years; outright sale only. FS-60, Eng. News-Record.

Wye Level for Sale.

22 inch, with powerful lenses, and split leg tripod. Practically new and in excellent condition. Call Sundays. J. M. H., 18 Delap Street, Jamaica, N. Y.

Roof Trusses

Fabricated steel roof trusses for building 75 ft. square with monitor sulitable for garage or foundry. For particulars address J. P. Scanlon, 33 East Main St., Columbus.

Carbic Lights For Sale

Two 2000 candle power Carbic lights as good as new. Price $30.00 each. B. W. Hicks, Vulcan, Mich.

"Monarch" Transit for Sale

Address M. F. Denman, 92 School St., Springfield, Mass.

LOCOMOTIVE CRANES

Offered subject to prior sale, inspection before shipment, etc.

Eight-Wheel Type, MCB, equipped.

20-ton Orton & Steinbrenner. Boom 45 ft. long. Brand new. Delivery in July; $22,000.

20-ton Browning. Boom 50 ft. long. Brand new. Delivery in July; $23,500.

Four-Wheel Type.

10-ton Industrial. Boom 38 ft. long. Good shape; $9500.

10-ton Browning. Boom 38 ft. long. Overhauled; $9750.

10-ton Orton & Steinbrenner. Boom 40 ft. long. About 2½ years old; $12,500.

All grab bucket operating cranes with exception of 10-ton Industrial, which is equipped for lifting only.

FS 80—Eng. News-Record
935 Real Estate Trust Bldg., Philadelphia

CONCRETE SEWER PIPE

60,000 feet; immediate delivery. New York; 6 to 24-inch, at less than one-half cost.

Has never been used.

AUSTIN FINEGAN
35 Nassau Street, New York City

KING & KING

Attorneys-at-Law
728 17th Str., Washington, D. C.

Attention specially given to matters relating to the rights of Government Contractors before the Executive Departments and the Court of Claims.

STRUCTURAL DETAILING

Consulting Engineer, New York, has an experienced force of structural detailers. Would like to hear from companies desiring to sublet such work.

ELWYN E. SEELY
101 Park Ave., New York, N. Y.

A Great Opportunity

Because of failing health, operator is forced to dispose of two

Stone Crushing Plants

Located on C. & O.
Near Richmond, Va.

More Government work being, and to be done in Tidewater, Virginia, than any other section and these quarries are nearest by rail or water to the Virginia capes. In perfect running condition and will sell or lease to responsible parties

Address Box 927, Richmond, Va.

I own the Patents Have You the Plant?

If you have the facilities to manufacture an all-metal joist and beam shore for concrete work, column clamps, etc., here's something you don't want to overlook.

Not an experiment. Products have been on the market for three years and thousands are in use today. Big success.

I own and control basic patents but need manufacturing facilities. If you have well-established sales organization in construction field, all the better. Address

M54—Eng. News-Record
1570 Old Colony Building, Chicago

CONTRACTORS AND ENGINEERS

We have developed a special process for manipulation of concrete by the use of compartments fitted to commercial truck bodies, which may revolutionize every other system on highway, building, or general construction.

Our stunt, which is thoroughly practical, cuts the labor force charging the mixer down to three men, does not reduce the tonnage nor the mileage of the trucks, and will keep any mixer charged to capacity.

For dependable speed under stress of labor shortage, low cost to assemble, big reduction on your pay roll and a desire to get a real war winner you should write us at once for particulars.

Address **LEYDECKER BROS.**, Kimball, W. Virginia.
Construction Superintendents

An Engine Factory with large capital and specialist in machines for shoes and boots can be interested in or quite undertake a method for the producing of shoes and boots patented here in U. S. of America. Possibly the foreign patents can be undertaken, too.

The patent protects a system of machines for "Pulling Over" and "lasting" and after the end of the war this system will no doubt have very large possibilities. The system can be seen in full activity at Copenhagen, and, if interested, please apply to Interessentskabet System S. S., Sanct Annae Passage. Store Kongensgade, Copenhagen K., Denmark.

SEARCHLIGHT SECTION

It Pays to *Watch* This Page

EVERY ADVERTISEMENT on this page provides an opportunity for some owner to sell his machinery immediately. It will pay you to keep track of what other readers want.

If *you* need equipment and don't find it in the For Sale pages, put *your* card here. It will tell other readers what *you* want.

It Pays to *Use* This Page

WANTED AT ONCE

New York Delivery

Contractor wants for personal use one or two 10-ton

STEAM ROLLERS

Must be in first-class condition. State lowest cash price, where can be inspected, and what delivery can be made.

W888—Eng. News-Record,
10th Ave. at 36th St., New York.

WANTED

GOOD SECOND-HAND

ROAD EQUIPMENT

1—10-ton, 3-wheel **Road Roller.**
2—**Traction Engines.**
32—3-yd. Dump-Bed **Spreader Wagons.**
1—1-yd. **Clamshell,** complete, to travel on dirt, self traction.
1—**Ditching Machine** with side cutting attachment to cut a one-to-one slope 6 feet deep.
1—**Grader,** 10-ft. blade.

State price and furnish cut of machines

STANDARD PAVING COMPANY
North Boston and Katy Tracks, Tulsa, Okla.

WANTED TO PURCHASE

DRAG LINE MACHINE

with boom, about 100 feet long; size of bucket from 2 to 4 yds; prefer Monighan or Bucyrus machine.

LOWER COAST CONSTRUCTION CO.
122 Chartres Street, New Orleans, La.

WANTED

Several 24-in. Gauge Storage Battery or Trolley

MINE LOCOMOTIVES

LINES FLYNN COMPANY
30 Church St., New York City

WANTED

1000 Standard

RAILROAD TIES

New or slightly used.

Quote price delivered.

THE HAMMERSCHLAG MFG. CO.
Garfield, N. J.

WANTED

1—1000 ft. Motor Driven
AIR COMPRESSOR
A. C. Motor

ONE AIR TANK

1—Stiff Leg
DERRICK
Complete—Engine Cable and Blocks

1—10-ton, 4-wheel
CRANE

1500 ft.
RAILS

1—2 or 3-yd.
CONCRETE MIXER

DOWNING DERRICK & WRECKING COMPANY
17 Battery Place, New York City.

WANTED

Several 2-ton

ELECTRIC LOCOMOTIVES

with or without batteries. State price, where located, condition and make.

CHAS. A. HASKIN
Schley St. and Princeton Ave., Jersey City, N. J.

WANTED

Construction Equipment

No plant too large, none too small. We buy for cash any place. Send list of what you have to

BECKWITH MACHINERY COMPANY
102 W. Parkway, N. S., Pittsburgh, Pa.

WANTED

CONTRACTORS' EQUIPMENT

of all kinds, for cash—also

PIPE AND FITTINGS

PIPE & CONTRACTORS SUPPLY CO.
3 Dover St., New York, N. Y.

WE WANT

CONTRACTORS' EQUIPMENT

AND

COMPLETE POWER PLANTS

We will buy single items or entire plants.

What Have You to Offer?

ARTHUR DANIELS CO., Inc.,
21 Park Row, New York, N. Y.

WANTED

DRAGLINES

2—No. 3 Monighan Walking Machines, gasoline operated preferred, consider steam, or Class "20" Bucyrus. State full details, age, condition and price.

W 41—Eng. News-Record
1570 Old Colony Bldg., Chicago, Ill.

SEARCHLIGHT SECTION

FOR RENT

For Immediate Use

now located at Staten Island, N. Y.

1—70-C Bucyrus Shovel.
1—18-B Bucyrus Shovel.
4—Vulcan Locomotives.
24—4½ yds. Cars.
Concrete Mixers, Rerricks, etc.

Beaver Engineering & Contracting Co.
51 Chambers St., New York City

RATES:

1 inch—$4.00
4 inches—$3.90 an inch

(The above rate applies to a 4-inch space in one issue, a 2-inch space in two issues, or a 1-inch space in four issues. The larger spaces following may be used up in a similar way.)

8 inches—$3.80 an inch
15 inches— 3.70 an inch
27 inches— 3.60 an inch

LOCOMOTIVE CRANES

1—Browning, No. 8, 20-ton, 8-wheel, M.C.B., 50-ft. boom. *Brand new. Immediate shipment.*

1—Browning, No. 8, 20-ton, 40-ft. boom, equipped for bucket, 8-wheel, M.C.B., overhauled. *Immediate shipment.*

Moore Bros REBUILT MACHINERY
39 So. La Salle St., Chicago, Ill.

Plant and Organization For Rent

On June 1, we will have available a complete organization for **Road Building** or **Street Paving**, everything that is needed from superintendent to water boy. Also a complete plant and equipment for building all kinds of road and street paving. This includes Motor Trucks, Teams, Rollers, Crushers, Concrete Mixers, Derricks, Asphalt Distributors, Asphalt Mixers, Boilers, Engines, Steam Drills, Air Compressors and necessary small tools.

We will rent the Plant on monthly basis and furnish an organization at cost plus basis.

SPROUL SUPPLY CO.
Peekskill, N. Y., or Clark Summitt, Pa.

FOR SALE, A

BATES STEEL MULE

1917 Model, 30 hp.

J. DONALD RICHARDS, Secy.
Warrenton & Fairfax Turnpike Co., Inc.
Warrenton, Va.

FOR RENT

COMPLETE EARTH HANDLING PLANT

including

1—Marion 60.
2½-yd. dipper.
3—36-in. gauge locomotives.
23—36-in. gauge Western two-way dump cars.
2—36-in. flat cars.
5000 ft. track, including ties and switches.
Pumps,
Water Tanks.
Portable Boilers, and
Miscellaneous lot small tools and repair parts.

Above plant in its entirety includes everything necessary for the complete operation of the plant and will be rented on a low basis for a reasonable term of rental.

TERWILLIGER EQUIPMENT CO., 2013 Market St., Philadelphia, Pa.

FOR RENT

1 Traveling Derrick

16-ft. Gauge Track.
Capacity 5 tons.

1 Stone, Sand or Gravel

Unloader

Capacity 250 tons 10 hours.

Apply to

CHARLES T. EASTBURN
Yardley, Pa.

BULL WHEELS

Immediate Shipment.

8 ft., $120.00
9 ft., $135.00
10 ft., $150.00

F.o.b. Ravenna, Ohio.
Subject to prior sale.

The John F. Byers Mach. Co.
Ravenna, Ohio

EQUIPMENT FOR RENTAL

200 Horses
All Kinds of Wagons
Scrapers and Grading Equipment
Steam Shovels
Hoisting Engines
Concrete Mixers
Air Compressors
Derricks and Derrick Equipment
Traction Engines
Locomotives
Unloading Plants
Spouting Systems
Pile Driving Equipment
Dredging Equipment
Crushing Plants
Steam Pumps
Gasoline Pumps
Steam Rollers
Road Machinery
Koppel Cars and Track
Drag Line Excavators
Motor Trucks
Steam Drills
Buckets

We can furnish Superintendents, Foremen, Operators, Mechanics and full working organization to go with this equipment.

T. H. GILL COMPANY, Whitney Point, N. Y.

SEARCHLIGHT SECTION

HOISTING ENGINE

FOR SALE

Lidgerwood, 7 x 10-in., double-cylinder, double drums, with Lidgerwood No. 4 Boom Swinging gear. Shop No. 29915-6.
2—300-ft. lengths 5/8-in. hoisting cable.
First-class condition. Located Jersey City, New Jersey.

E. C. SHERWOOD
50 Church St., New York

FOR SALE

6 K Gates Crusher

Practically as good as new.

Immediate delivery. Bargain price. Used only a few weeks. Location—Central Pennsylvania

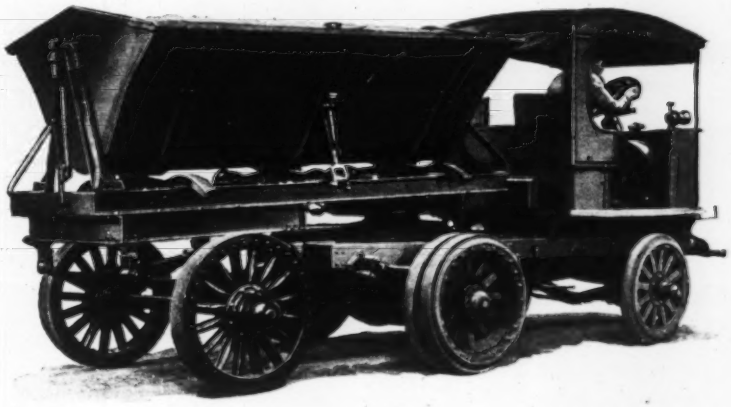
F. C. LUCAS CO.
156 Broadway, New York, N. Y.

AIR COMPRESSORS

Good Condition

1—INGERSOLL-SARGENT duplex steam air, 1540 cu.ft., air press. 30-50 lb. 159-201 hp.
1—RAND, duplex steam air, 1600 cu.ft., air press, 50-75 lb., 323-400 hp.
1—INGERSOLL-RAND straight line, 974 cu.ft., air press, 25-100 lb.
1—Rand comp. steam; duplex air, 2693 cu.ft., air press, 50 lb., 340 hp.
1—INGERSOLL-SARGENT duplex steam 1000 cu.ft., hp. 195.

WELBORNE & CO.
Machine and Small Tools
45 Beaver St., New York



Here's a Real Bargain

Watson Tractor, and Semi Trailer, equipped with Lee Side Dump Body.

Brand new. Offered at a bargain because it is of special construction and not a part of our regular line.

Write for particulars

Watson Wagon Company

20 W. Center Street, Canastota, N. Y.

70-BUCYRUS SHOVEL

One 70-Bucyrus shovel with 2½-yd. dipper. Just rebuilt in locomotive shop.

Perfect Condition.

Bargain, $6250

F.o.b. Davenport, Iowa.

Machinery Warehouse & Sales Co.
794 Old Colony Bldg., Chicago, Ill.

STEAM SHOVEL and CARS

1—New Atlantic, Type 80, 3½-yd. dipper
1—70-C Bucyrus, Shop No. 1261, 3-yd. dipper
10—Standard gage, 6-yd. K. & J. Cars
8—36-in. gage, 4-yd. Western Cars
6—36-in. gage, 2-yd. "V" shape Koppel Cars
20 tons 20-lb. Relayers

Many sizes of **Air Compressors**, belted and steam
Tanks to suit every purpose
Boilers, vertical, fire-box and return tubular
Buckets, clamshell, orange peel and turnover
Cableways, many sizes
Concrete Mixers
Crushers, Road Rollers, Water Wagons and Screens
Hoisting Engines, 3-drum, 2-drum and single-drum, in many sizes, with and without boilers
20—Light **Locomotives**, 4-wheel, saddle tank, 14 to 20 ton
Pumps of every description.

Write, Wire or Phone for our list before placing your order.

Pittsburgh Machinery & Equipment Co.
302 Fulton Building, Pittsburgh, Pa.

FOR SALE—One Austin

TRENCHING MACHINE

In good order

BROCKTON GAS LIGHT COMPANY
Brockton, Mass.

SEARCHLIGHT SECTION

Receiver's Sale of the

ST. JOSEPH VALLEY RAILWAY

25 Side dump Ballast Cars, just rebuilt, 66,000 lb. with sideboards, 24 yd.

Have new boards, bolts, posts for all 25 cars. Standard gage; 24 ft. outside overall. Inside total, 17 ft. Degree incline, 45 per cent; over body, 22 per cent. Incline bottom, 3 ft. Flat bottom, 11 ft. Width overall, 8 ft. 10 in.; inside, 7 ft. 11 in.; rail to top, 7 ft., inside, 3 ft. Rail to top floor, 4 ft. Independent dump. Doors, 16 x 28 in. Westinghouse brakes. Steps and Grab Irons all M.C.B., standard. Four doors each side. Tower steel couplers, 5 x 5 shank. Total wheelbase, 19 ft. 4 in., 33-in. cast wheels. 9 x 11 wood bolsters. National hollow steel brake beams. 8 x 10 malleable journal boxes. Weight, 21,500 lb. Truck wheel base, 5-ft. twin full elliptic springs hung inside. 4½ x 8 journal brasses. Cars take 42 ft. radius curve, coupled M.C.B. Painted; fine condition. Cash price, $650 each.

ALSO

1—Good three-compartment **Trolley Car,** G. E. 57, 4 motors, 55 ft. long.
1—**Snow Plow.**
1—Steel underframe **Trailer.**
1—Edison-Beach **Storage Battery Car,** 8 wheels, 55 ft. long, four motors, steel underframe, modern, fine shape.
1—All steel Hall Scott **Gasoline Three-Compartment Car,** 60 ft. overall, fine shape, full swing Janney couplers; $7500. Act quickly.
15—Miles No. 9 hard drawn **Copper Phone Wire,** with porcelains and latest 50-A selective ringing Western Electric phones, with dispatchers, complete set for 15 station railway; has cabinet with more than 30 positions.
60—Miles **Copper No. 10 Gage,** with porcelains for immediate delivery, price 32c. a lb., Elkhart, Ind. Act quickly. Now selling.

Small way stations, car barns, scales, etc.

H. E. BUCKLEN, *Receiver*, Elkhart, Ind.

Special—Immediate Delivery

Machinery For Moving Materials

STANDARD GAUGE LOCOMOTIVES

5—Vulcan 4-wheel 12 in. x 16 in. Saddle Tanks, weighing 25 tons
2—American 4-wheel 14 in. x 24 in. Saddle Tanks weighing 35 tons
1—American 4-wheel 17 in. x 24 in. Slope Tender weighing 40 tons
1—Baldwin 4-wheel 18 in. x 24 in. Slope Tender weighing 50 tons
1—American 6-wheel 17 in. x 24 in. Slope Tender weighing 45 tons
1—Baldwin 6-wheel 17 in. x 24 in. Slope Tender weighing 50 tons
2—American Moguls 18 in. x 24 in. Square Tender weighing 55 tons
1—Baldwin Mogul 19 in. x 26 in. Square Tender weighing 65 tons
1—American Mogul 19 in. x 24 in. Square Tender weighing 60 tons

The above locomotives have been thoroughly overhauled.

36 in. GAUGE LOCOMOTIVES

6—Porter 4-wheel 9 in. x 14 in. Saddle Tank Contractors type
2—Vulcan 4-wheel 9 in. x 14 in. Saddle Tank Contractors type
3—Vulcan 4-wheel 10 in. x 16 in. Saddle Tank Contractors type
6—Porter 4-wheel 11 in. x 16 in. Saddle Tank Contractors type
1—Baldwin Consolidation 15 in. x 20 in. Square Tender, weighing 38 tons
1—American Forney 10 in. x 16 in., weighing 25 tons, 2-4-4 type
2—Vulcan 10-wheel 14 in. x 20 in. Square Tender weighing 35 tons

STANDARD GAUGE CARS

50—Flat Cars 50,000 lb. cap., 35 ft. long, M.C.B.
30—Flat Cars 60,000 lb. cap., 36 ft. long, M.C.B.
42 Gondolas 80,000 lb. cap., 35 ft. long, M.C.B.
25 Hoppers 60,000 lb. cap., 24 ft. long, M.C.B.
23 Box Cars 60,000 lb. cap., 36 ft. long, M.C.B.
2—Steel Flats 100,000 lb. cap., 40 ft. long, M.C.B.
19—Oliver Dump Cars 12-yd. cap., 23 ft. long, M.C.B., air brakes

RAIL

500—tons 45 and 50 lb. Rail

HOISTING ENGINES (Steam)

1—Flory 10 in. x 12 in. double cylinder single drum without boiler
1—Flory 9 in. x 10 in. double cylinder double drum with boiler
2—Lidgerwood 8½ in. x 10 in. with D.C.D.D. boiler
2—Stroudsburg 8½ in. x 10 in. D.C., D.D., with blr.
1—Flory 10 in. x 12 in. D.C., D.D., with boiler
4—Lidgerwood 7 in. x 10 in. D.C., D.D., without blr.
3—Mundy 5½ in. x 10 in. D.C., D.D. with boiler
2—Lidgerwood 6½ in. x 8 in. D.C., D.D., with blr.
2—Lidgerwood 5 in. x 8 in. D.C., D.D., with blr.
1—Lidgerwood 8½ in. x 10 in. D.C., D.D., parallel without boiler
1—Crook 8½ in. x 12 in. D.C., D.D., without blr.
1—Mundy 6½ in. x 12 in. D.C., D.D., with boiler
1—American H & D 7 in. x 10 in. D.C., D.D., with boiler
1—Flory 7 in. x 10 in. D.C., D.D., with boiler and swinger

These hoists are all in fine shape ready to go to work.

HOISTS (Electric)

1—3 drum with swinger 150 H.P. A.C. motor
1—3 drum with swinger 75 H.P. D.C. motor
1—double drum 100 H.P. D.C. motor
1—double drum 50 H.P. D.C. motor
2—double drum with swinger 30 H.P. D.C. or A.C. motor
9—double drum with swinger 25 H.P. D.C. and A.C. motor
3—single drum with swinger, 25, 37 and 5 H.P. A.C. motor

DERRICKS

1—Steel Guy, 66 ft. mast, 54 ft. boom, complete with guys, etc.
1—Steel Guy, 100 ft. mast, 85 ft. boom, complete with all fittings
1—Steel Stiff Leg, 50 ft. mast, 80 ft. boom, complete with all fittings
2—Steel Guys, 80 ft. mast, 70 ft. boom, complete with all fittings

Also several wooden stiff leg and guy derricks and travelers.

BOILERS

1—150 H.P. Locomotive type
2—65 H.P. Locomotive type
2—40 H.P. Locomotive type
10—165 H.P. Vertical type

We also have several air compressors, air pumps, tanks, rock crusher, etc.

Will rent a large portion of this equipment at reasonable rates.

HOISTING MACHINERY COMPANY
50 Church Street, New York City

BARGAINS FOR IMMEDIATE DELIVERY

BRAND NEW MOTORS AIR COMPRESSORS, AIR RECEIVERS

3—5 hp. West. Type C. S., 1725 r.p.m., 220 v., 60 cy., 3 phase.
1—2 hp. West. Type CSA. 1700 r.p.m., 220 v., 60 cy., 2 phase, with standard pulleys, no rails. New York.
3—3½ x 4 Ingersoll-Rand Type 12, Vertical Compressors.
5—4½ x 5 Ingersoll-Rand Type 12, Vertical Compressors, with reservoir coolers. New York.
3—30 in. x 72 in. Air Receivers. 3—36 in. x 72 in. Air Receivers.
4—42 in. x 84 in. Air Receivers. 1—42 in. x 96 in. Air Receivers, tested, with tapped openings. Oswego, N. Y.

PACIFIC FLUSH TANK COMPANY, 149 Broadway, New York City
Phone, Cortlandt 4130.

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999 New and Used
Surveying & Scientific Instruments
Rented, Bought, Sold & Exchanged

Architects & Engineers' Supply Co.
913 Grand Ave., Kansas City, Mo.

USED
Transits and Levels
FOR SALE

THE ENGINEERING AGENCY, INC.
1662 Monadnock Block, Chicago

FOR SALE
Three second-hand, high-grade Young & Sons and Heller & Brightly

ENGINEERS TRANSITS
in good condition, **$135 each**

FS 926 Eng. News-Record
935 Real Estate Trust Bldg., Philadelphia, Pa.

SEARCHLIGHT SECTION

COMPRESSORS

	Price
1—12x12x12 Ingersoll, capacity 300′	$ 750
1—12x12x16 Ingersoll, straight line, steam driven, capacity about 300′ at 80 to 100 lb.	600
1—Sullivan, 2 stage air, simple steam, capacity 1800′ at 80 to 100 lb.	2500
1—14x16x10x16 Sullivan, 2 stage air, simple steam, capacity 600′ at 80 to 100 lb.	1500
1—14x9x10 Bury, 2 stage, belt driven, capacity 350′	1500
1—Ingersoll-Rand, belt-driven, 2-stage, 500′	2000
1—Sullivan 2 stage, belt driven, 1400′ good as new, f.o.b. St. Louis	4500

CARS

20—4 yd. Western, 2 way, contractors 36″ gauge, wooden bodies, ea.	$125
70—2½ yd. steel bodied, end dump quarry cars, 36″ gauge, ea.	80
30—2½ yd. steel bodied, end dump quarry cars, 48″ gauge, ea.	75
20—1½ yd. Western, standard gauge MCB, air dump cars, good condition, ea.	900
50—1½ yd. Koppel "V"-shaped, 24″ gauge, steel cars, new, ea.	120

CRUSHERS

1—No. 9 Style "K", almost new	$7000
1—No. 5 Austin, angle drive, fine condition	1500
1—No. 6 Style "K" Gates, fine condition, each	1500
1—No. 7½ Austin, almost new	2800
1—10x20 Blake jaw crusher on skids	800
1—No. 5 McCully, almost new	1500

ELEVATOR AND SCREENS

1—No. 9 with 36″ buckets, good condition without belt	$900
1—Stephens & Adamson stone screen, 42″x16′, with dust jacket, practically new	700
1—48x18 Austin screen with dust jacket	800
1—48x20 McCully screen with dust jacket	900
6—Stephens-Adamson Screens, each	150

CLAM SHELL BUCKETS

	Price
1—¾ yd. Owen with teeth, almost new	$450
2—1½ yd. Hayward, first class	650
1—1 yd. Browning	500
1—1½ yd. Page Dragline	500
1—2 yd. Brown hoist Clam	800

CRANES

1—60-ton Industrial Erecting Crane, 8-wheel, M.C.B., 60-ft. boom, with 20-ft. extension. Everything latest improvement.	
1—7 ton, 4 wheel Vulcan Bucyrus single line crane	6,000

HOISTING ENGINES

1—7x10 Lidgerwood D.C., D.D., with boiler	1100
1—7x10 Lambert, 3 drum, with boiler	1600
1—8x12 Mundy DCDD, with boiler	1300
1—9x10 Lidgerwood, 3 drum, 32″ drums, without boiler	2000
with boiler	2300
1—Clyde 9x10, 3 drum with boiler, f. o. b. Mich.	2500
1—5x8 D.C., D.D. Reversible O&S, with vertical engine, without boiler	350
with boiler	550
1—7x10 Lambert DCDD, with boiler	1100

LOCOMOTIVES

1—9x14 Porter 36 in. gage saddle tank	1400
1—9x14 Davenport 36 in. gage, saddle tank	1400
1—10x24 Baldwin, 10 wheeler, 60 tons. Just re-built	8000
1—18x24 American, 10 wheeler	6000
1—17x24 6 wheel switcher	8000
1—14x24 Pittsburgh saddle tank, standard gauge with separate tender	4000
2—7x12 Davenport 24 in. gauge, each	1500

DRAGLINES

1—Monighan-Walker steam machine, with 50′ boom, 1½ yd. bucket, almost new	$7000
1—Flory outfit engine 10x12 heavy dragline type boiler, firebox 150 lb. pressure, boom 60′, steel bucket, 2 yd. New 1917	9000
1—No. 3 Monighan 65 ft. boom, 3 yd. bucket, fine condition	11,000

RAIL

	Price
400 tons—35 lb., with angle bars	$57
1500 tons—56 lb., with angle bars	58
1500 tons—70 lb., with angle bars	58

PUMPS

1—10″ Morris, sand, belt drive	$500
1—8″ Morris, water, belt drive	300
1—20x10x14 Worthington duplex	600
1—Wilson-Snyder water works pump, complete with condenser	2000

STEAM SHOVELS

1—No. 1 Thew Traction, 1¼ yd. perfect condition	5500
1—No. 0 Thew traction with ⅝ yd. dipper, fine condition	4000
1—No. 1 Vulcan revolving shovel, standard gauge with ¾ yd. dipper, good as new	4500
Same as above, with 35′ crane boom	5500
1—45 ton Bucyrus, standard gauge, 1¾ yd. dipper	6500
1—Model 60 Marion with 2½ yd. dipper	7000
1—70 ton Bucyrus with 2½ yd. dipper	6250

CABLEWAYS

1—9x10 Lidgerwood, 3 drum engine and boiler and carriage and part of other fittings, no rope	$3000
1—7x10 Flory steam DCDD with boiler, carriage and all fittings but no rope	1950

BOILERS

1—25 hp. vertical American hoist and derrick	$800
1—40 hp. firebox on steel truck	550
1—50 hp. vertical butt strap	750
1—60 hp. vertical Lidgerwood	800

MOTORS

1—20 hp. Westinghouse, 60 cycle, 3 phase, 220 volt	$400
2—30 hp. Westinghouse, 60 cycle 3 phase, 2200 volt	500

MACHINERY WAREHOUSE & SALES COMPANY, *Successors to* GEO. C. MARSH & CO.

Tel. Harrison, 5799 **794 Old Colony Bldg., Chicago**

Cableway Engine For Sale Cheap

Flory cableway complete reversible link motion with 7 x 10 engine and boiler, 400 ft. 1½-inch cable, tower, platform, blocks, turnbuckles, complete outfit in first class condition. Cheap before removing.

MARINE METAL & SUPPLY COMPANY
167 South Street, New York City

90-ton
MIKADO LOCOMOTIVE
New 1917

Cylinders 20 x 26.
200-lb. pressure.
Traction force 37,000 lb.
Used one year.
Good as new.

MACHINERY WAREHOUSE & SALES COMPANY
794 Old Colony Bldg., Chicago, Ill.

Second - Hand Transits and Levels
Guaranteed in Good Order and Adjustment.
Write for New Bargain List.
WILLIAMS, BROWN & EARLE, INC.
918 Chestnut St., Philadelphia, Pa.
Department D

I WANT TO SELL
2—6½ x 10
LAMBERT HOISTS
D.D., D.C., boiler attached.
1—7½ x 10
MUNDY HOIST
D.D., D.C., boiler attached.
Prompt delivery. Ready to work.
H. H. WEIR
Room 724—25 Broad St., N. Y. City
Phone 3816 Broad

SEARCHLIGHT SECTION

Air Compressors

1—3336 cu.ft. OC-3 Ingersoll-Rand steam-driven.
1—3000 cu.ft. Full Corliss Nordberg steam-driven, 40 lb. air. NEW
1—1260 cu.ft. NEW XPV-3 Ingersoll-Rand steam-driven.
1—446 cu.ft. X-3 Ingersoll-Rand steam-driven.
1—396 cu.ft. WB-2 Sullivan steam-driven.
2—1253 cu.ft. X-4 Ingersoll-Rand steam-driven, 50 lb. air.
1—96 cu.ft. NF-1 Ingersoll-Rand steam-driven.

Belt Driven

1—1190 cu.ft. class XB-2 Ingersoll-Rand two-stage, with belt and 200 hp. Form L. G. E. Motor, 3 bearings, 3 ph., 60 cy., 550-220-440 v., 600 r.p.m., pulley and base.
1—275 cu.ft. class XB-2 Ingersoll-Rand two-stage.
MANY others steam and belt-driven.

Boilers

2—350 hp. Stirling, 175 lb. steam pressure, Mass.
2—150 hp. B. & W. 150 lb. steam pressure, Mass.
1—150 hp. HRT, Mass., 150 lb. pressure with stack.
2—66 in. HRT Boilers, 100 lb. steam pressure, Mass., 120 lb. other States, with 42 in. dia. x 90 ft. steel stack.
2—301½ hp. Edgemoor Boilers, 200 lb. steam pressure, Mass., with Foster superheaters.

Turbo Generators

1—75 Kw. G. E. 125 v. D.C., speed 2400.
1—625 Kw. Allis-Chalmers, 3 ph., 60 cy., 2200 v., with all accessories.

A. LEE ELLIS
10 High St., Boston, Mass.

FOR RENT—FOR SALE

Portable Boilers

Hoisters, Air Compressors, Concrete Mixers, Centrifugal Pumps, Diving Outfits, Rock Drills, Derricks, Pile Drivers and General Contractor's Equipment, both Steam and Electrically Driven.

MARVIN BRIGGS, Inc.
167 Sixth St., Brooklyn, N. Y.
Tel. South 5471

FOR SALE

2—500 hp. Rust **Water Tube Boilers** complete with all fittings and trimmings. Equipped with Westinghouse stokers.
2—70 to 80 hp. Butt joint **Locomotive Type Boilers.**
2—72 x 16 ft. Erie City **H. T. Boilers** with fittings and stack.
1—66 x 16 Erie City **H. T. Boiler** with fittings.
200 ft. 8 in. flanged **Wrought Iron Pipe.**
1—6-ton Buffalo Tandem **Steam Roller.**
1—Morgan-Gardner 250-volt **Mining Machine.**

E. E. McCARTNEY
769 Wilson Ave., Youngstown, Ohio

FOR SALE

2—150-hp., butt strap **Boilers.**
10—Manning **Boilers,** 165 lb. steam pressure.
1—16 x 36 **Corliss Engine.**
1—9 x 10 **Mine or Shaft Hoist.**
1—¾-yd. Ransome **Concrete Mixer,** complete, in A-1 condition.

O. R. WHITNEY
39-41 Cortlandt St., New York
Phone Cortlandt 6095

Hogan Water Tube

BOILERS

2—250-hp. Hogan Water Tube Boilers, width 17 ft. 9 in.; depth, 8 ft. 8 in.; height to top of nozzle, 22 ft. 6 in.; hydraulic pressure test, 300 lb. per sq.in.; working steam pressure test, 200 lb. per sq. in.; 256 2-in tubes; 32 3-in. tubes; 2617 sq.ft. total surface. 57 sq.ft. total grate area. 1 steam cylinder, 42 in. dia., 8 ft. 9 in. long; manhole opening, 14 in. dia. 2 distributing cylinders, 24 in. dia., 7 ft. 1 in. long; 2 manhole openings, 14 in. dia. each cylinder.

PENNSYLVANIA WATER COMPANY
712 South Ave., Wilkinsburg, Pa.

FOR IMMEDIATE DELIVERY

AIR COMPRESSOR

Portable, Chicago Pneumatic, gasoline-driven, size 11½ x 8 x 12 H.S.G., 165 ft. per minute. New York delivery.

MANUFACTURERS & CONTRACTORS' EQUIPMENT CO.
132 Nassau St., New York
Phone Beekman 2218

BOILER FOR SALE

Sealed bids will be received at the office of the Director of Public Service, Troy, Ohio, at 12 o'clock noon,

Wednesday, July 10, 1918

for the sale of one 200-hp. Stirling Water Tube Boiler complete, equipped with shaking grates.

Said property to be sold to the highest bidder as it stands, on skids, f.o.b Electric Plant, Troy, Ohio, upon the following terms:—CASH.

The Director of Public Services reserves the right to reject any or all bids when in the interest of the City.

R. P. HENNESSEY,
Director of Public Service.
F. A. Fischer, Clerk.

CORLISS ENGINE

FOR SALE

One used 16 x 36 heavy-duty left-hand Corliss Engine, 150-hp., at 125 pounds steam, 80 revolutions. Flywheel pulley 14-ft. x 24-in. face and belt pulley 11-ft. x 20-in. face on engine shaft. Immediate delivery.

THE WELLMAN-SEAVER-MORGAN CO.
Cleveland, Ohio.

Air Compressor, 100 lb.

310-cu.ft. Ingersoll-Rand, 12¼ x 12, class NE-1, belt driven.

A. G. Schoonmaker & Sons, Inc. *(Owners)*
25 Church Street, New York City

50-KW. GENERATORS

Two General Electric, 300 r.p.m., 125/250-volt, 50-kw., 3-wire Generators, direct connected to Ball Engines. Generators one right-hand and one left-hand. Outfit complete with all apparatus.

Everything good as new and ready for immediate shipment.

F. MAYER
1601 Monadnock Bldg., Chicago

FOR SALE

1—94 Kv.-a. Non-condensing

Turbo-Alternator Set

consisting of:

Type "G" single stage TERRY Steam Turbine, running at 3600 RPM. and direct connected through flexible coupling, and mounted on same base with 94 Kv.-a. 100% P.F., 480 volt, 60 cycle, 3-phase alternating current, ALLIS-CHALMERS Generator. Shipping weight approximately 7500 lb.

GEO. B. DOUGLAS
29 Broadway, New York City

DIRECT CONNECTED

GENERATING SET

500 Kv.-a General Electric Revolving Field, 3-phase, 25-cycle, 480 volts, 107 r.p.m., direct connected to Hardie Tynes Cross Compound Corliss Engine, 22 x 44 x 44, complete with switchboard, instruments and connections, with 45-Kw. Exciter, belted to main shaft, 125 volts. Fort Wayne. This set good as new, housed, and operated less than four months. May be inspected at plant of Coosa Portland Cement Co., Ragland, Alabama.

For details and price apply

J. F. DONAHOO CO.
Birmingham, Alabama
Also other smaller plants

FOR SALE

9—250-hp. water tube vertical

BOILERS

Fine condition. Immediate shipment
Wire or Write for Price, etc.

THOS. J. DOLAN
76 W. Monroe St., Chicago, Ill.

COMBINED ENGINE AND BOILER

1—40-hp. "Ames" Locomotive Boiler on skids, with 12 in. x 15 in. engine mounted on boiler; good condition.

L. F. SEYFERT'S SONS, INC.
437 N. 3rd St., Philadelphia, Pa.

SEARCHLIGHT SECTION

Repaired Equipment

We offer the following thoroughly repaired equipment either for sale or rent.

Steam Shovels

1—Marion 91, 4-yd. dipper
1—Marion 75, 4-yd. dipper
3—Bucyrus 70-C, 2½-yd. dipper.
1—Marion 70, 2½-yd. dipper.
1—Bucyrus 18-B Revolving, caterpillar traction, ⅞-yd. dipper
1—Bucyrus 18-B Revolving, on traction wheels, ⅞-yd. dipper
1—Type "B" Erie, ¾-yd. dipper, full revolving traction wheels
1—Marion 28, ⅝-yd. dipper, full revolving traction wheels

Locomotives (Narrow Gage)

6—10 x 16 dinkeys, 18-ton, 36-in. gage
2— 9 x 14 dinkeys, 15-ton, 36-in. gage
1—Fate gasoline locomotive, 3-ton, 36-in. gage

Cars

18—12-yd. Western Air Dump, standard gauge
125— 4-yd. Western, steel beam, 36-in. gage
50— 4-yd. Western, wood beam, 36-in. gage
14— 4-yd. Continental, wood beam, 36-in. gage
1—Western Spreader, hand operated
10—6-yd. Western, standard gage

Compressor

1—Ingersoll-Rand, class AA-2, steam driven, 879 ft. capacity.

Hoists

1—3-drum, 8¼ x 10 Flory, with boiler and swinger
3—1-drum, 6¼ x 10 Mundy, skeleton
1—1-drum, 6¼ x 10 Byers, skeleton
1—2-drum, 6¼ x 10, Byers, with boiler
1—2-drum, 9 x 10 Lidgerwood Cableway Engine

Cableways

1—Lidgerwood Cableway, complete except towers, 9 x 10 engine, 1164-ft. span, 3-ton capacity
1—Length 2½-in. Cable, plow steel, 6 x 37, 2230 ft. long

Boilers

1—80-hp. Locomotive type boiler
2—30-hp. Vertical.
2—15-hp. Erie Vertical.
1—15-hp. O. & S. Vertical.

Clamshell Buckets

1—Blaw type "E," 1-yd.
3—Owen 1-yd.
2—Owen ¾-yd.
1—Dobbie 1½-yd.
1—McMyler 1½-yd.

Concrete Mixers

2—Foote 27-S, on skids, leader, engine and boiler
3—Chain-Belt No. 2, on trucks, engine boiler, loader and tank, 14-ft. wet capacity
2—1-yd. Smith, style 14, on skids with engine, no boiler
3—Smith, ½-yd., Model 12, on trucks, loading skip, engine and boiler
1—Smith, ¾-yd. side loader, boiler and engine
2—Foote 40-S, on trucks with engine
1—Foote 27-S, on trucks
1—Foote 27-E, on trucks

Miscellaneous

1—No. 3 Union Steam Hammer.
1—No. 6 McKiernan-Terry Steam Hammer.
1—No. 2 Vulcan Steam Hammer.
Emerson Pumps, Nos. 2, 3, 4 and Junior.
1—Vulcan Drop Hammer.
2—Swaby No. 8 Centrifugal, 10-in. suction, 8-in. discharge.
1—No. 2 Union Steam Hammer.

H. KLEINHANS CO.
UNION ARCADE, PITTSBURGH, PA.
EASTERN OFFICE: 30 CHURCH ST. NEW YORK

SEARCHLIGHT SECTION

AIR COMPRESSOR WITH MOTOR

1—1190 cu.ft. two-stage, class XB-2 Ingersoll - Rand belt-driven compressor, with leather belt, 200-hp., Form L—G. E. motor, 3 bearings, with pulley and base. 3-ph., 60-cy., 550-220-440 v., 600 r.p.m.

A. LEE ELLIS
10 High St., Boston, Mass.

PIPE All sizes, bargain prices, second-hand and new

IMMEDIATE DELIVERIES:

8,000 ft. of 12 -in. pipe	50,000 ft. of 2 -in. pipe
10,000 ft. of 8 -in. pipe	50,000 ft. of 1½-in. pipe
10,000 ft. of 6 -in. pipe	100,000 ft. of 1¼-in. pipe
10,000 ft. of 4 -in. pipe	100,000 ft. of 1 -in. pipe
15,000 ft. of 3 -in. pipe	

Also a large stock of 16, 18 and 20-in. pipe.

PIPE & CONTRACTORS SUPPLY CO., 3 Dover Street, New York, N. Y.

Dragline Machine

1—Lidgerwood Dragline Machine on Rollers, 85-foot boom, 3½-yard Page Bucket, first-class, located in Mississippi. $15,000. Net cash. QUICK SALE.

J. F. DONAHOO CO., Birmingham, Ala.

I-BEAMS

Fine Condition *Prompt Delivery.*

40—12-in. Beams, 10 to 11 ft., 9 in. long.
350—15-in. Beams, 17 to 19 ft., 8 in. long.
150—20-in. Beams, 15 to 18 ft. long.

Variety of other beams on hand. Send us your specifications.

TANKS

1—Open, round Tank, 15 ft. diameter, 15 ft. high, ¼-in. plate, practically new.
8—Conical Tanks, overall length 16 ft. 2 in., largest diameter 9 ft. 5 in., length of tank 14 ft. 2 in., made of ⅜-in. plate.
10—6 ft. diameter x 20 ft.
10—6 ft. diameter x 17 ft.
Many others—open and closed.

PIPE

Large stock, all sizes of second-hand pipe, re-threaded and coupled, for immediate delivery.

TUBES

Seamless (New)

5-tons, 2½-in. x 7-ft. 1-in.

Lap Welded (New)

150-ton, 2½, 3, 3½, 3½ and 4-in., 15 to 20 ft. long.

BOILERS

2—Erie City Watertube, 400-hp., each.
2—Aultman & Taylor Watertube, 100-hp. each.
1—Sterling, 250-hp.; 1—Horizontal Tubular, 78 in. x 19 ft. 4½ in.
1—Horizontal Return Tubular, 200-hp., Mass. standard.

Vertical and other types in stock.

Prompt delivery.
Send us a list of your requirements.

THE PERRY, BUXTON, DOANE CO.
216 W. 1st St., So. Boston, Mass.

Wrought Pipe

New and Second-Hand

GUARANTEED

Large Stock—All Sizes
Special Low Prices

Eagle Pipe Supply Co., Inc.
30 Church St., New York City
INQUIRIES SOLICITED

Buckeye and Parsons'

DITCHING MACHINES

FOR SALE OR RENT

GENERAL EQUIPMENT COMPANY
30 Church Street, New York, N. Y.

PIPE

New, Untested Black Steel Pipe, all sizes, random or cut lengths. For all structural work.

Immediate delivery.

Davidson Pipe & Supply Co.,
861 Western Ave., N. S.
Pittsburgh, Pa..

FOR SALE—TO RENT

DITCH EXCAVATOR

Austin 00 now on government work at Harrisburg, Pa. Available after July 15, 1918.

TRENCH EXCAVATING CORPORATION
Care of Benjamin Catchings
1012 Sixteenth St., N. W., Washington, D. C.

FOR SALE
2—VULCAN No. 2

Steam Pile Hammers

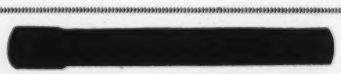
With steel rams, ready for work.

MACHINERY RENTAL & SALES CO.
Contractors and Industrial Equipment
2918 Southwest Blvd., Kansas City, Mo.

WATER PIPE

100 tons of used 12-in. cast-iron water pipe

THE PERRY, BUXTON, DOANE CO
216 W. First St., So. Boston, Mass.



Wrought Iron Pipe, thoroughly overhauled, with new threads and couplings, guaranteed to give entire satisfaction. Pipe cut to sketch. It will pay to correspond with us.

ALBERT & DAVIDSON, Inc.
Oakland and Kent Sts., Brooklyn, N. Y.

SECOND-HAND PIPE

Large Stock—All Sizes

Recut—Perfect Threads and Couplings

Also a Large Stock
Contractors' Equipment

Marine Metal & Supply Co.
167 South Street, New York

TUBING, ALL SIZES **PIPE CUT TO SKETCH**

SECOND-HAND PIPE

Large stock, all sizes, furnished with new threads and couplings

JAMES F. GRIFFITH - 416-24 Moyer Street, Philadelphia, Pa.

PIPE SECOND HAND

With new threads and couplings; also cut to sketch.

PFAFF & KENDALL
Ferry & Foundry Sts., Newark, N. J.

New and second-hand. With new threads and couplings. All sizes from ⅛ to 12 in. Also cut to sketch.

DAVIDSON PIPE & IRON CO.
436-40 Kent Ave., Brooklyn, N. Y.

SEARCHLIGHT SECTION

SEND FOR COMPLETE LIST

Giving Description, Location and Prices of Equipment Used on the Following Completed Contracts:

Kensico Dam
At Valhalla, N. Y.

and

Cut and Cover Contract
At High Falls
for
Board of Water Supply

Magnolia Cut-Off
For B. & O. R.R.

12 Barge Canal Contracts

A FEW SELECTIONS FROM

OVER 1000 REAL BARGAINS

LOCOMOTIVES

1	Porter	36 in. gauge, saddle tank locomotive, 10 x 16, built 1905-6.
	Davenport	36 in. gauge, saddle tank locomotive, 10 x 16. Shop No. 531.

CARS

60	H. S. Kerbaugh	36 in. gauge, 4 cu. yd., 1-way dump cars, all overhauled
10	Oliver	Standard gauge, 6 cu.yd. dump cars
4	Continenta	Standard gauge, 6 cu.yd. dump cars
28	H. S. Kerbaugh	Standard gauge, 8 cu.yd. dump cars
5	H. S. Kerbaugh	Standard gauge, 10 cu.yd. dump cars

DERRICKS

10	Guy derricks, masts 80 ft. to 92 ft., booms 80 ft.to 85 ft., square and octagon sticks, castings 18 in. and 20 in. with steel bull wheels without guy, hoisting or swinging lines
3	Stiff leg, twin, traveling derricks, masts 18 in. x 18 in. x 30 ft., booms 16 in. x 16 in. x 55 ft.

HOISTING ENGINES

2	Lambert	Hoisting engines, 7 x 10 D.D., D.C. Skeleton, Shop Nos. 1990 and 2371
2	Flory	Hoisting engines, 50 H.P., No. 372, spec. compound geared, fitted with link motion, D.C., S.D., 48 in. x 24 in. Shop Nos. 4524-5

ELECTRICAL PLANT AND EQUIPMENT

2	Flory	Cableway engines, 300 H.P., with carriage, fall block, head tower sheaves, fall rope carriers, top tower castings, but without hoisting or hauling lines
1	Williams	75 H.P. electric hoist, 2-drum, with 11 H.P. electric swinging winches, motors, 3-phase, 60 cycle, 220 volt
	Maine Elec. Co.	75 H.P. electric hoists, 2-drum, with 7½ H.P. electric swinging winches, motors 3-phase, 60-cycle, 220 volt

FLOATING EQUIPMENT

1	Dipper dredge "Pontiac" hull, 95 36 x ft., boom 45 ft., dipper stick 46-ft., dipper ¾ cu.yd. Complete and in first-class condition

Empire Engineering Company, Inc.

6 Church Street *Contractors — Engineers* **New York**

SEARCHLIGHT SECTION

2½-Yd. MARION Dredge

Wooden Hull, 33 ft. x 7 ft. x 89 ft. 45-ft. Boom, complete with all equipment, including 50 Light Generator. Now located in Hudson River.

American Pipe & Construction Co.,
112 North Broad St., Philadelphia
ROBERT WETHERILL, *Receiver*

TRENCH MACHINES

Track Jacks and Chain Slings

Buckeye Gasoline Trench Machine cuts 15 in. and 18 in. wide, 5½ ft. deep, equipped with round traction wheels; has been used on 5000 ft. trench work only; excellent condition complete for immediate delivery.

Buckeye steam Trench Machine with Boiler and Engine cuts 15 in. and 18 in. wide by 5½ ft. deep; equipped with round traction wheels, ready for delivery in two weeks.

50—Barrett and Duff 15 Ton double acting ballast trip Jacks excellent condition, immediate delivery.

75—Bell bottom screw jacks 2½ in. screw x 22 in. high.

150 special high-grade chain slings sizes from ¾ in. to 2 in. inclusive lengths 8-0 to 25-0 ft. with hooks or rings, testing certificates for each sling.

MARINE METAL & SUPPLY CO.
167 South Street, New York City.

FOR SALE

IMMEDIATE DELIVERY

Four-Million Gallon

PUMPING ENGINE

One 12 and 19 and 30 x 17 x 24 Horizontal Direct Acting Triple Expansion Piston Valve Outside Center Packed Plunger Pattern Pumping Engine. Water End good for 150 lb. water pressure. This engine has never been in use.

FS253—Eng. News-Record
935 Real Estate Trust Bldg., Philadelphia

We Own and Offer for Immediate Delivery

STEAM DREDGE

3-yd. orange peel bucket with pair of 12 x 24 hoisting engines; 90-hp. locomotive boiler, hull 83 x 34 ft.

AIR COMPRESSOR

200-ft. Chicago Pneumatic Air Compressor, gasoline driven, tank mounted type, complete on wheels.

CENTRIFUGAL PUMP

8-in. Lawrence centrifugal pump direct connected to 25-hp., 220-volt motor.

CONSOLIDATED MACHINERY & WRECKING CO.
50 Church Street, New York, N. Y.

FOR SALE

TRENCH MACHINES

2—Austin Trench Machines, No. 00, each one year old.
1—Austin Trench Machine, No. 1 (Steam Driven).

AIR COMPRESSOR

McKiernan-Terry Air Compressor, 14 x 14 x 14.

RELAYING RAILS

400 to 600 tons Relaying Rails, 56-70 lb.

THE T. E. McSHAFFREY CONST. CO.
Akron, Ohio

PUMPS

2—16 x 7 x 18 Duplex Plunger Pumps, good for 200 lb. pressure. Good as new, at a bargain.

WARD EQUIPMENT CO.
341 Fourth Ave., Pittsburgh, Pa.

MORRIS PUMP

FOR SALE

1—6-in. right-hand, standard Morris Centrifugal Pump, direct connected to a 6 x 6 vertical engine. *In excellent working condition.*

MILLER-CRIPPEN EQUIPMENT CO., Inc.
418-419 First National Bank Bldg., Syracuse, N. Y.

12-INCH HYDRAULIC DREDGE

Fully equipped. Electric light plant, Pontoons, Pontoon pipe, shore pipe, rubber sleeves and bands, coal scow with mast and boom. Double drum, hand power with wire blocks and falls. Galley and sleeping quarters for eleven men. All in first-class condition, ready to go into commission.

A. R. Powley Dredging & Construction Co., Inc.
P. O. Box 65, Kingston, N. Y.

FOR RENT OR SALE

ONE 0 AUSTIN TRENCHER

Immediate shipment

KENNEY BROS., Lowell, Ind.

FOR SALE

PUMPS

1—Smith-Vaile Triplex Double-Acting Pump, 7½-in. x 8-in. 300-ft. head. Geared to 50-hp., 2000-volt motor with switchboard and auto transformer.

1—2-stage, 5-in. Turbine Centrifugal Pump, 300 gal. per minute. 200-ft. Total. 1 head. Direct connected to Ft. Wayne, 35-hp., 440-volt, Squirrel Cage Motor, switchboard and starter.

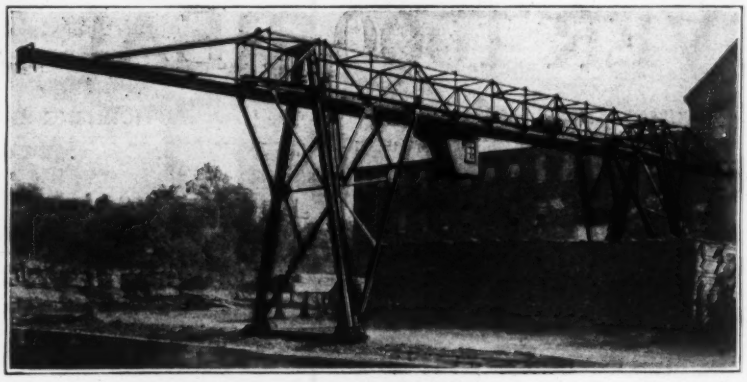
1—2-stage, 5-in. Turbine Centrifugal Pump, 500 gal. per minute. 200-ft. Total Head. Direct connected to Ft. Wayne Squirrel Cage Motor, 45-hp., 440-volt, with switchboard and starter.

PIPE AND VALVES

About 18,500 ft. of 8-in. Converse Steel Pipe and 7,600 ft. 8-in. cast iron bell and spigot Class "B" and 6 8-in. Vaives, all in good condition.

All bids to be in by July 15, 1918

Address all bids to the City Clerk of the City of Checotah, Okla.
W. E. McIntosh, City Clerk.



GANTRY CRANE

Main span 70 ft.; overhang arm 28 ft. 7 in. and 38 ft. 0 in. either end: clearance to underside girders 28 ft. 0 in. Wheel base 21 ft. 6 in.

Capacity about 2 tons. Adapted for handling materials from boat or cars, or shipyard work. Electrically operated; 440-v.; 3-ph.; 60-cycle; bridge travel 60 ft. per minute on track.

Used less than two years; built 1912. Details on application. Apply to

GEORGE B. DOUGLAS, 29 Broadway, New York

SEARCHLIGHT SECTION

LOCOMOTIVE CRANES

One 25-30-ton McMyler 8-wheel bucket operating 70-ft. boom. Crane equipped with generating outfit; magnet can be used; M.C.B. equipped; immediate shipment.

One 20-ton McMyler, 50-ft. boom, 8-wheel, M.C.B., bucket operating; four years old; used little; immediate shipment.

One 20-ton, 8-wheel, 35-ft. boom Brown Hoist, bucket operating, M.C.B. equipped; immediate shipment.

STEAM SHOVELS

One No. 2 Thew revolving full circle swing Steam Shovel mounted on standard gauge trucks Shovel carries a 1¼-yd. dipper.

One Model 28 Marion Traction Steam Shovel, Shop No. 3153. Has a ⅝-yd. dipper.

One Osgood full circle swing Traction Truck. Has a ¾-yd. dipper. Shovel six months old.

One Osgood Traction Steam Shovel, with a ¾-yd. dipper. This shovel has extra long boom and dipper sticks for trench work or is suitable for stripping.

LOCOMOTIVES

One 7 x 12, 24-in. gauge Davenport, 4-wheel Saddle Tank Locomotive.

One 10 x 16 Davenport, 36-in. gauge, 4-wheel Locomotive.

One 10 x 16 Porter, 36-in. gauge, 4-wheel Saddle Tank Locomotive.

Two 11 x 16 Vulcan, 36-in. gauge, 4-wheel Saddle Tank Locomotives, practically new.

One 12 x 18 Porter standard gauge, 4-wheel Saddle Tank Locomotive.

One 11 x 16 American standard gauge, 4-wheel Saddle Tank Locomotive.

HOISTING ENGINES

One 6½ x 10 D.C., D.F.D., Mundy Skeleton Hoisting engine, with swinger attached.

Three 7 x 10 D.C., D.D., Lambert Hoisting Engine, complete with boiler.

One 7 x 10 D.C., D.D., Flory Hoisting Engine, complete with boiler and swinger attached.

One 6½ x 10 D.C., D.D., Mundy Hoisting Engine, complete with boiler.

One 7 x 10 D.C., D.D., Carlin Hoisting Engine, complete with boiler and attachable swinger.

One 8¼ x 10 D.C., T.F.D., Lidgerwood Skeleton Hoisting engine.

One 7 x 10 D.C., S.F.D., Flory Hoisting Engine, complete with boiler.

One 7 x 10 D.C., S.D., Lidgerwood Hoisting Engine.

One 7 x 10 D.D. Lambert Skeleton Hoisting Engine.

One 5½ x 7 Byers D.C. single-drum with boiler.

One 6 x 7 Byers double cylinder, double drum with boiler.

One 5½ x 7 Byers D.C. Builders' Hoist, reversible with large sheave and boiler.

SWINGING ENGINES

One 4½ x 6 double cylinder, Mead-Morrison.

One 4½ x 6 double cylinder, Williamson Bros.

One Lambert counterweight drum for operating bucket.

BUCKETS

Six 21 cu.ft. Koppel center drop bottom, double door Dump Buckets (new).

Seven 27 cu.ft. Koppel center drop bottom, double door Dump Buckets (new).

Ten 1¼-yd. Steubner self righting, self dumping Buckets.

Six Insley ¾-yd. drop bottom controllable Dump Buckets.

STEAM ROLLERS

One 5-ton Iroquois tandem Steam Roller.

One 6-ton Kelly-Springfield tandem Steam Roller.

One 7-ton Universal tandem Steam Roller.

One 5-ton Erie tandem roller.

One 10-ton Avelling-Porter single cylinder road roller.

Two 5-ton Buffalo-Pitts tandem Steam Rollers, almost new.

BOILERS

One 50-H.P. fire box Locomotive Type Boiler, first-class condition. Good for 100 lb. steam pressure.

One 75-H.P. Erie Economic Locomotive Type, good for 100 lb. steam pressure.

Two 300-H.P. and two 250-H.P. Stirling Water Tube Boilers, hand fired.

Boilers in first-class condition; insured by Globe Indemnity Company at 145 lb. working pressure.

All equipment offered by us overhauled and given a running test in our shops, all equipment guaranteed. Special attention given to rental of equipment. Write for our liberal terms. Send for our complete list.—Get on our mailing list.

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509-11-13 Wabash Bldg. Yards—Shops—Rutherglenn St.

PITTSBURGH, PA.

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RAILS

200 tons 100 lb. P.R.R. Sec. with angles. **New.**
1000 tons 90 lb. A.R.A.—A with angles. **New.**
55 tons 66 lb. with angles. **New.**
100 tons 65 lb. A.S.C.E. with angles. **New.**
400 tons 60 lb. A.S.C.E. with angles. **New.**
300 tons 45 lb. A.S.C.E. with angles. **Relay.**
300 tons 40 lb. A.S.C.E. with angles. **Relay.**

In stock, immediate shipment.

LOCOMOTIVES

24-in. Gage

12—8-ton Davenport S.T. steam 150-lb. **First-class.**

36-in. Gage

13—14-ton Porter S.T. 9 x 14 cyl. 140-lb. steam. Overhauled completely. **Ready for shipment.**
1—14-ton Davenport S.T. 9 x 14 cyl. 140-lb. steam. **Overhauled completely. Ready for shipment.**
1—7½-ton Davenport S.T. 6 x 10 cyl. 160-lb. **Overhauled. Exceptional.**

4-ft. 8½-in. Gage

1—49½-ton Vulcan, 6-wheel Switcher. **Strictly first-class.**
1—30-ton Davenport 4-wheel S.T. **First-class.**
1—26-ton Davenport 4-wheel S.T. **First-class.**

FLAT CARS

19—36-ft. 60,000 cap. **Overhauled.**

GONDOLAS

24-In. Gage

29—19 ft. 6 in., 20,000 cap. all steel, double hopper bottom. **Good condition.**

STEEL PILING

Shipment from Stock

156 pcs. 10-ft. Lackawanna, 12¾ x ⅜
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80 pcs. 20-ft. Lackawanna, 12¾ x ⅜
470 pcs. 25-ft. Lackawanna, 14 x ⅜
160 pcs. 26-ft. Lackawanna, 14 x ⅜
185 pcs. 30-ft. Lackawanna, 14 x ⅜
220 pcs. 20-ft. United States, 12 x ⅜
208 pcs. 20-ft. United States, 12½ x ⅜
100 pcs. 40-ft. United States, 12½ x ⅜

Only partial list of stock—Wire your requirements.

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2-yd. Browning Bucket, smooth lips. **First class. In stock East St. Louis.**

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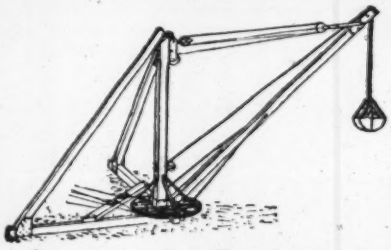

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1—¾-yd. Hayward Clam Shell
2—2¼-yd. extra heavy Hayward, 3-blade Orange Peels

LOCOMOTIVE CRANES

1—5-ton, 4-wheel, double drum, American
1—10-ton, 4-wheel, single drum, Industrial

STEEL DERRICKS

1—3-ton American, 60-ft. horizontal boom, Steel Crane Derrick, with guys and engine on mast.
2—20-ton, 100-ft. boom, Steel Guy Derricks

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Complete, including 12¼ x 15, D.D. Lidgerwood Dredging Engine, 2—7 x 10, D.D. Skeleton Lidgerwood Engines, 1—80-hp. Nagle Boiler, and all fittings and timbers above deck for bucket work. Perfect condition, used only few days.

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1000 ft. (one piece) 2-in. Locked Coil Cable, with lugs and U-bolts used

T. H. LETSON CO.
50 Church St., New York, N. Y.

New and Second-Hand Equipment

FOR SALE

New Chapman Sluice Gates

2—New 60 in. x 60 in. Bronze Mounted, Rectangular, Rising Spindle, Standard Frame, each with 46 in. Extended Spindle, Fig. 476, Page 208, List 89, Cat. No. 32, Chapman Valve Co.
2—Heavy Geared Double Crank, Ball Bearing Floor Stands, with enclosed gears, for use on above gates, Fig. 442, Page 173, List 76, Cat. No. 32.
1—Direct connected **Steam Electric Generator Set,** Generator-Northern, Direct Current Type B, Form M, 25 kw., 500 r.p.m., 125 volt, Compound Wound. Engine, Giles, Type E, Vertical 7 x 7 Single Acting, Double Piston, 125 lb. gauge pressure, non-condensing.
25 ft. **New Suction Hose,** diameter 20 in., made of 15-ply Hose Duck, coated both sides, tube walls, ⅛ in. steel spiral, wrapped ⅝ in. x 2½ in. pitch, corrugated.
600—Second-hand Northern and Western **Cedar Poles,** 22 ft. and 25 ft., cut down from longer lengths. Good condition.

T. R. HARBER, *Purchasing Agent*
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20-ton NILES, 3-motor, 75-ft. span, 40-ft. lift 500-volt, D.C. (will rewind for 220-volt, D.C.) Fish belly box girders, cage control, excellent condition. *Immediate delivery.*
3-ton **Maris Bros.**, 3-motor, 35-ft. span, 30-ft. lift, 220-volt, D.C., floor control, late type, excellent condition.

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Lidgerwood Crawford Class B Excavator
60-ft. boom, 1½-yd. capacity bucket.

Bement-Niles Drop Hammer
800-lb. blow.

Tug Boat Engine
Fore and aft compound, 12-in. stroke, 9-in. high pressure cylinder, 18-in. low pressure cylinder.

Sullivan Submarine Drills
Frames, weights and engines.

Girders, Through Plate
Good for 100-ton load. Two each of the following lengths: 59 ft. 6 in., 70 ft. 6 in., 87 ft. 6 in., 91 ft. 6 in.

New York State Dredging Corporation
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BYERS

No. 328 Derrick Car and Excavator and ¾-Yd. Bucket

Slightly used. Will sell at greatly reduced price.

The John F. Byers Mach. Co.
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Four Ludlow Sluice Gates

Size 36-in. x 48-in.

Comprising four complete sets, gates, stands and shafting sufficient for a 60-ft. dam. This equipment has never been used. For sale, F.O.B. Salt Lake, Utah.

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LOCOMOTIVE CRANES

FOR SALE

1—15-ton Browning, 8-wheel, standard gauge, 40-ft. boom, 2-drum.
1—20-ton Orton & Steinbrenner, 8-wheel, standard gauge, 45-ft. boom, new.

Everything for Contractors.

JOHN M. GREENE
261 Drexel Bldg., Philadelphia, Pa.

SEARCHLIGHT SECTION

ACME ROAD MACHINERY CO., Frankfort, N. Y.

OFFERS THE FOLLOWING REBUILT EQUIPMENT

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1—No. 10½ Acme Crusher 12 x 22, rebuilt with all new wearing parts. Manganese steel cheek plates and chilled Crushing Plates.
1—No. 9½ D Acme Crusher 11 x 18, with all new working parts.
1—No. 3 Climax Crusher 10½ x 22, rebuilt. New working parts all strictly first-class condition.
1—No. 2½ Climax Crusher 10 x 20 opening, rebuilt with all new working parts mounted on 4-wheel truck, all new fittings.
1—No. 5 Champion Crusher 11 x 26, rebuilt and strictly first-class condition.
1—No. 4 Champion Crusher 9 x 15, rebuilt, in strictly first-class condition.
1—9 x 18 Indiana Crusher, rebuilt and in strictly first-class condition.

ELEVATORS

1—Belt Elevator 33 ft. centers with 18 in. buckets, new.
1—No. 9½ Acme Elevator, rebuilt, in good condition, 26 ft. centers.
1—No. 9 Acme Elevator, almost new, 35 ft. long, back geared.
1—No. 9 Acme Elevator, rebuilt, in first-class condition, 16 ft. centers.

SCREENS

1—12 in. x 30 in. screen head driven, open tooth gear with the following perforations: ⅝ in., 1¼, 2¼, 3½, complete with frame work.
1—30 in. x 15 ft. screen, 5 ft. of ⅝ holes, 3 ft. of 1¼, 4 ft. of 3 in., and 3 ft. of 3 in.
1—36 in. x 16 ft., screen, with the following holes: ⅝, 1¼, 2½, 3½.

PORTABLE STONE BINS

1—75-ton semi-portable Bin, almost new, used one season, complete, side dump, discharge gate.
1—15-ton Acme portable Bin on wheels, rebuilt and in first-class condition.
1—25-ton Austin Western Telescope Bin, rebuilt and in first-class condition, never been used but little.

TRACTION ENGINES

1—Double cylinder Monarch Hauling Engine, rebuilt, in strictly first-class condition.
1—50 hp. Rumley, nearly new, strictly first-class condition, double cylinder hauling engine.

PORTABLE ENGINES AND BOILERS

1—8 hp. Portable Engine and Boiler on wheels, new flues throughout, rebuilt, strictly first-class condition.
1—18 hp. Farquhar Portable Engine and Boiler on wheels, rebuilt, strictly first-class condition.
1—40 hp. Portable Engine and Boiler on wheels, Massachusetts Standard Boiler, used less than a year. Strictly first-class condition, fitted with two driving pulleys.

ENGINES

1—35 hp. Boiler, 30 hp. Engine, on skids.
1—20 hp. outward bearing long stroke Engine, 60 x 10 in. flywheel, strictly first-class condition.
1—25 to 30 hp. Erie Engine Works, center crank Engine, rebuilt, strictly first-class condition.
1—65 hp. Chandler & Taylor side self-contained Engine, rebuilt, new.
1 band wheel, 72 in. diam., 17 in. face; size of cylinder, 14 x 16; hp. 65; speed 150 r.p.m.; two pulleys, 66 in. diam., 12½ in. face; crankshaft 5¼; length of journals, 12 in; diam. of steam pipe, 4 in.; diam. of exhaust pipe, 5 in.; diam. of crankshaft bearing, 5½ in. x 14 in.; crank pin, 3½ in. x 4 in.
1—70 hp. Erie Engine Works center crank balance crank Engine, practically new.
Size of cylinder, 14 x 16; hp. 70; speed 150 r.p.m.; two pulleys, 66 in. diam., 12½ in. face; crankshaft 3¼; length of journals, 12 in.; diam. of steam pipe, 4 in.; diam. of exhaust pipe, 5 in.
1—14 x 14 center crank Automatic Watertown Engine.
Hp. 160; speed 240 to 260 r.p.m.; flywheel, 66 in. diam., 14½ in. face; crankshaft, 6½ in. diam.; crankshaft bearings, 13 in. long; crankshaft pin, 6½ in. diam., 5 in. long; width of engine outside flywheels, 72 in.; length over all, 130 in.; steam exhaust pipe, 6 in.; steam pipe, 5 in.
1—American Ball Engine, center crank. Cylinder, 16 x 16; automatic governor in flywheel; crankshaft, 6½ in. diam.; crankshaft bearings, 14 in. long; crank pin, 8½ in. diam., 6½ in. long; length over all, 147 in.; width over all, 76 in.; diam. of steam pipe, 6 in.; diam. of exhaust pipe, 7 in.; 2 flywheels, 78 in. diam., 17½ in. face; speed, 220 to 240 r.p.m.; hp., 200; weight, 16,900 lb.

BOILERS

1—40 hp. Portable Boiler on wheels, good working condition, new flues.
1—Erie City Iron Works, Vertical Boiler, 40 hp., complete with fittings, containing 128 2-in. flues 6 ft. long.
1—100 hp. return flue tubular Boiler, strictly first-class condition, with fittings and fixtures, including injector, boiler insured for 80 pounds working pressure. Can be seen in operation any time during the month of January.

ROAD ROLLERS

1—6-ton "Tandem," Buffalo-Pitts. Fine condition.
1—10-ton Standard Universal Roller, in first-class condition.
1—10-ton Combination Roller and Engine Buffalo Pitts, first-class condition.
1—12-ton rebuilt Roller, good working condition.

HOISTING ENGINES

1—8 hp. single cylinder, single drum, good working condition, double cylinder drum, two winding spools, boiler reflued, containing 77 2-in. flues, 57 in. long, all in good working condition, cylinders 6½ x 11 in., 3 ft. x 7 ft. Boiler.
Makers, Contractors' Plant Company.

CONCRETE MIXERS

1—No. 2 Foote Mixer, complete, first-class condition, rebuilt, steam drive.
1—No. 3 Foote Mixer, complete, first-class condition, rebuilt, steam drive.
1—No. 14 Chicago Paver, with rotary distributing spout.

ROAD SCRAPERS

1—Little Winner Grader, almost new, repainted, with new cutting edge.
1—J. I. Case heavy Grader, practically new, repainted.
1—Acme Asphalt Pressure Distributing and Heating Tank, page 83, catalogue No. 9, rebuilt, like new.

STEEL SCRAPERS

5—No. 2½ Wheeler Scraper, first-class condition.

ROCK DRILLS

1—3¼ in. Wood Drill, complete with tripod and weights.
1—3⅝ in. Wood Drill, complete with tripod and weights.

PLOW

1—No. 65 Rooter Plow, first-class condition.

DUMP CARTS AND TRACKS

3—Koppel Double Side Discharge Roller-Bearing Steel Cars, 24 in. gage, 1½ yd. capacity, good condition.
31—15 ft. sections, 24 in. gage, complete with steel ties, one switch and two curves.

MISCELLANEOUS

1—380-gal. Acme Tar Tank, rebuilt.
1—10-bbl. water tank, second-hand.

MOTOR

1—Westinghouse Electric & Mfg. Company Type "C" Induction Motor, constant speed 15 hp., E.M.F., 300 amps. per terminal, 37.7 alts., 6200, serial No. 306563.

SHOVELS

1—Style 0 Thew Shovel, ⅝-yd. dipper, revolving.
1—Bucyrus Steam Shovel, ⅝-yd. dipper, revolving.

All of the above material is offered subject to prior sale and f.o.b. cars Frankfort.

All machinery can be seen at the factory of the Acme Road Machinery Company, located six miles east of Utica, on the New York Central and West Shore Railroads, and also on the New York State Railways, Interurban Lines.

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1—Sellers

RIVETING BULL

operated by steam or air, 50 tons capacity, 100 lb. air, 72-in. throat, 5-in. stroke, capacity 1-in. rivets. Machine is in good operating condition.

INDUSTRIAL SERVICE COMPANY
Lincoln, N. J.

FOR SALE

15,000 ft. 4-in. wrought Pipe, with new threads and nipples.
20 tons 6-in. cast iron B. & S. Pipe, with elbows, tees and hydrants.
25 tons 20 and 25 Relaying Rails.
40 all-steel Flat Cars, 54 x 56 in. wide, 36-in. gage, for brick yards, etc.
50-hp. locomotive type Boiler.
100 reels ¾ to 2½ Wire Ropes, for hoisting, skidding, cables and guys.
20,000 ft. NEW ¼ galvanized Wire Rope, long and short.
Two Reels, 9000 ft. each, ¼ and 1 reel each. 3000 ft. 1¼ and 1½ PLOW Steel Wire Rope, 6-19 will cut to suit.
Two continuous Concrete Mixers on wheels, $350 each, with gasoline engines.
Two 36-gage Saddle Tank Baldwin Locomotives, used one year.
One mile each 2-, 3- and 4-in. wrought Pipe, used for air purposes; equal to new.

EASTON MACHINERY CO.,
Drake Bldg., Easton, Pa.

LOCOMOTIVE CRANES

1—10-ton O. & S. 4-wheel standard gauge 40 ft. extension boom, equipped for bucket. Immediate delivery.
1—20-ton O. & S. 8-wheel standard gauge 45 ft. boom. July delivery.

Complete line of Hydraulic, Dipper and Suction Dredges, Tugs and Barges, also Locomotives, Cars, Crushers, Hoists, Mixers, etc.

F. E. B. O'BRIEN
41 S. 15th St., Philadelphia, Pa.
Phone Spruce 2262

SEARCHLIGHT SECTION

MACGOVERN & COMPANY — POWER MACHINERY

114 Liberty St., New York, N. Y.

CATERPILLAR TRACTOR

1—80-hp. Hornsby Steam Caterpillar Tractor, with compound driving engine mounted directly on top of boiler; tractor and tender approximately 20 ft. long over all, approximate extreme width over caterpillar chains 9 ft., length of caterpillar chains 17 ft. Complete with two heavily built, 4-wheeled trailers and one trailing sled for winter use.

HOISTS

Electric Driven

2—Lidgerwood Contractors' or Hod Hoists, single drum, designed for 1500-lb. rope pull at 1000 ft. per min., drums 30-in. diam. x 24-in. face x 4-in. flange, each hoist geared to one 52-hp. General Electric, IQC, form M motor, 220 volt, 60 cycle, 830 r.p.m.

1—Lidgerwood Contractors' or Hod Hoist, single drum, drum 30 in. diam. x 24-in. face x 4-in. flange, geared to 52-hp. Westinghouse, type 10-K series wound motor, 220 volt, direct current, 525 r.p.m.

1—Lidgerwood Contractors' or Hod Hoist, single drum, designed for 1500-lb. rope pull at 1000 ft. per min., drum 30 in. diam. x 24-in. face x 4-in. flange, geared to 52-hp. Westinghouse, type 10-K, series wound motor, 550 volt, direct current, 878 r.p.m.

5—Lidgerwood Contractors' or Hod Hoists, single drum, designed for 1500-lb. rope pull at 1000 ft. per min., drums 30-in. diam. x 24-in. face x 4-in. flange, each hoist geared to one 52-hp. Westinghouse, type 10-K series wound motor, 220 volt, direct current, 700 r.p.m.

2—Mead-Morrison, double-drum Hoists, drums 30-in. diam. x 24-in. face x 3-in. flanges, capacity 2500 lb. at 400 to 500 ft. per min., geared to 40-hp. Westinghouse, type 10-K motors, 500 volt, direct current, 510 r.p.m.

1—Maine double-drum Hoist, drums 12-in. diam. x 24-in. face x 6-in. flange, capacity 3000 lb. on a single line at rope speed of 250 ft. per min., direct connected to 37-hp., 440-volt, 60-cycle motor, 1200-r.p.m.

Steam Driven

2—Flory, 8½ x 10-in., double cylinder, double drum, reversing steam hoists, drums 27-in. diam. x 30-in. face, capacity 3000 lb. on a single line on one drum at a time.

1—Lidgerwood, 5 x 8-in. double cylinder, single drum, steam Hoist, arranged for boiler, drum 14-in. diam. x 21-in. face, x 6-in. flange, 2000-lb. capacity, approximately 8 hp.

1—Lambert, 6½ x 10-in., single cylinder, single drum steam Hoist, with 18-hp. boiler.

1—O. & S., 7 x 10-in., double cylinder, single drum steam Hoist, drum 14-in. diam. x 21-in. face x 6-in. flange, 5000-lb. capacity, approx. 20 hp.

1—Lambert, 7 x 10-in., double cylinder, double drum, steam Hoist, drums 14-in. diam. x 22-in. face x 6-in. flange, 5000 lb. capacity, 20 hp.

1—Lidgerwood, 7 x 10-in., double cylinder, double drum steam Hoist, drums 16 in. diam. x 18-in. face x 7-in. flange, 5000-lb. capacity, approx. 20-hp.

1—Lidgerwood, 7 x 10-in., double cylinder, double drum, steam Hoist, drums 14-in. diam. x 26-in. face x 6-in. flange, 5000-lb. capacity, approx. 20-hp.

AIR COMPRESSORS

Steam Driven

1—Rand, cross compound, 2-stage, 22 x 40 x 39 x 24 x 48-in., class RBH-3, 65-r.p.m., steam end designed for 150-lb. steam pressure condensing, air end 80 lb., capacity 4000 cu.ft.

1—Ingersoll-Sargent cross compound, hp. 22 x 22½ x 42-in., L.P. 40 x 36½ x 42-in., steam pressure 120-140 lb. condensing, air pressure 90, 100 and 110 lb., 70-r.p.m., capacity 2626-cu.ft.

1—Ingersoll-Rand straight line, class A-1, 20 x 22½ 24-in., capacity 1000 cu.ft. air per min. at 85 to 100-lb. pressure.

1—Clayton, duplex, 2-stage, 10 x 18 and 10 x 10-in., 175-r.p.m., capacity 425-cu.ft.

1—Ingersoll-Rand, low pressure, type NF-1, 6 x 10 x 6-in., capacity 114-cu.ft.

RATES:

1 inch—$4.00
4 inches—$3.90 an inch

(The above rate applies to a 4-inch space in one issue, a 2-inch space in two issues, or a 1-inch space in four issues. The larger spaces following may be used up in a similar way.)

8 inches—$3.80 an inch
15 inches— 3.70 an inch
27 inches— 3.60 an inch
50 inches— 3.50 an inch

Rates for larger spaces furnished on application.

Cableways

1—1200 ft. **Lambert**, complete steam
1— 800 ft. **Lidgerwood**, complete steam
1— 450 ft. **Lidgerwood**, complete steam

Air Compressors

3—150 ft. **Ingersoll-Rand Electric**
1—450 ft. **Ingersoll-Rand Electric**
1—800 ft. **Ingersoll-Rand Electric**

Hoisting Engines

1— 7-ton **Lambert**, D.D., D.C., 220-volt
1—10-ton **Lidgerwood**, D.D., D.C., 250-volt
1— 5-ton **Mundy**, S.D., D.C., 220-volt

Concrete Mixers

1—½-cu.yd. **Ransome**, power loader, electric
1—½-cu.yd. **Foote**, power loader, electric
1—½-cu.yd. **Smith**, power loader, electric
1—½-cu.yd. **Lakewood**, power loader, electric
1—10-ft. **Rex**, gasoline

Ask for Special List. *Preferred attention.*

F. WILLIAM STOCKER, INC.
Hoboken, N. J.
'Phone 2274 Hoboken

Mine Hoisting Engine

FOR SALE

Mundy Improved Single Friction Drum Hoisting Engine, double cylinder, 8½ x 13, weight hoist on single line 5000 lb. Size of drum overall 38-in. diam. x 42-in. wide, in first-class operative condition.

MARINE METAL & SUPPLY CO.
167 South St., New York City

HOISTING ENGINES

FOR SALE

1—7 x 10, D.D., D.C., Lidgerwood, complete with Boiler and Swinger (new flues in boiler)
2—7 x 10, D.D., D.C., Lidgerwood Skeletons, with Swingers

MILLER-CRIPPEN EQUIPMENT CO., Inc.
418-419 First National Bank Bldg., Syracuse, N. Y.

Marion "Model 28" Steam Shovel

Full revolving, on traction wheels, ⅝-yd dipper. Shop No. 2807.

Price, $4000 f. o. b. Chester, Pa.

We can furnish almost anything desired in the way of Steam Shovels. Get our prices first.

WM. B. GRIMSHAW CO.
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STEEL CABLE

1—Rope 2½ in. 6 x 19 plowsteel 1840-ft.
1—Rope 2 in. 6 x 19 plowsteel 600-ft.
1—Rope 1¼ in. 6 x 19 plowsteel 700-ft.
1—Rope ¾ in. 6 x 19 plowsteel 3500-ft.
2—Ropes 1 in. 6 x 19 plowsteel 2500-ft. each.
2—Ropes ⅞in. 6 x 19 plowsteel 1400-ft. each.
Several ropes ¾ in. 6 x 19 plowsteel 800-1000 ft.
10,000 ft. ½ in. and ⅝ in. in various lengths.
Some good 1-in. 6 x 7 haulage ropes.
All of the above 85% to 95% efficient.

Prompt Shipment.

B. CARPENTER
118 N. LaSalle St., Chicago, Ill.

FOR PROMPT SHIPMENT

8 x 12, D.C., D.D. **Mundy Skeleton**
8½ x 10-in., D.C., D.D. **Lambert Skeleton**
7 x 10, D.C., D.D. **American Skeleton**
10 x 12, D.C., S.D. **Flory Mine Hoist**
1—No. 2 Vulcan **Steam Hammer**
1—2800-lb. **Drop Hammer**
1—25-hp. Scotch Marine Type **Boiler**
1—40-hp. Locomotive Type Oil Country **Boiler**
1—100-hp. Locomotive Type **Boiler**, Butt-strapped
1—4-in. Erie Centrifugal **Pump**, S. E. attached
1—6-in. Morris Centrifugal **Pump**, S. E. attached
3—Stiff-leg **Derricks**
600-ft., 6-in. **Pipe**, good as new
1—30-ft. Koehring **Mixer**, on trucks, batch hopper and 15-hp., 220-volt, 3-phase motor
1—No. 12 **Smith Mixer**, on skids, steam engine only
1—20-ft. **Ransome**, steam engine and boiler
1—½-yd. **Smith**, on trucks, steam engine and boiler
Gravel Washing Plant
Steam Shovels, Locomotives, Cars, Rail, Track, Pipe, Cableways, Cable

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HOISTS

Compressors - Boilers - Mixers
Derricks - Cableways

For Sale or Lease

HOISTING ENGINE SALES COMPANY
Grand Central Station, New York

FOR SALE

2—American **Hoisting Engines**, 6¼ x 10, complete with boiler and all fittings, D.D., D.C., each $800.
1—No. 3 **Vulcan Hammer.**

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Keep your eye on the Searchlight and your advertisements in it.

SEARCHLIGHT SECTION

MACHINERY and TOOLS
of
Birmingham Boiler Works
Owned and For Sale by
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1—**Extra Heavy 36 in. Combination Single End Punch and Shear** made by Reade Machinery Co., Cleveland, Ohio, complete with punches and dies, but no shearing attachments, capacity 1¼ through 1½ in.
1—**Scully Rotary Splitting Shear**, capacity ¾ in.plate, six extra cutting discs
1—**W. H. Wood size No. 31 Hydraulic Riveter**, complete with accumulator, high pressure pump, overhead traveling crane, tank and hydraulic hoist, gap has 8 ft. 3 inch clearance
1—**Lennox Rotary Bevel Shear, size No. 2**, capacity ¾ in. steel. Six extra cutting discs or shear blades
1—**Set 10 ft. 6 in. Power Bending Rolls**, with reversing mechanism, hand raising and lowering attachments, top roll 12 in. diameter, bottom rolls 8 in. diameter
1—**Wall Radial Drill** or Countersinking Machine, 12 ft. arm, will drill and ream 11¼ in., belt drive, 4-step cone
1—**Chicago-Pneumatic Air Motor Hoist**, 5-ton capacity, ⅜ in. cable
1—24 in. **Bickford Drill Press**
1—**McGrath Air Flue Welder**, complete with 18 x 36 oil burning Rockwell furnace
1—**Flue Cutter and Cleaner**, 120 in. long, belt drive
2—**Sturtevant 30-in. Steel Pressure Blowers**, $40 each.
2—**Heavy cast iron round Blacksmith Forge Bowls** with connections, 48 in. dia. $35 each
1—**American Radial Drill**, 42 in. arm, 36 in. swing, cone drive, with swinging and tilting table, with worm movement
1—**No. 4 Long and Allstatter Combination Punch and Shear**, 5 in. throat, no shear attachments have punches and dies
2—**Anvils**, 250 lb. each.
1 good shape, $25; 1 poor shape, $15
300 ft. **Track**
200 ft. 2 7/16 in. dia. **Line Shaft with Pulleys and Hangers**
1—**10 x 16 Nagle Center Crank, Slide Valve Engine**
1—**60 in. x 16 ft. Horizontal Boiler**, (return tubular)
1—**10 ft. x 10 ft. x 6 in. deep 3/16 in. Plate Tank**, (open top)
1—**30 in. wide 36 in. deep, 12 ft. long Tank**, (open top)
1—**10-gallon air pressure Fuel Oil Burner or Torch**
1—**Air Drill**
1—**6 in. Wrought Iron Vise**
1—**Hand Power Hack Saw**
1—**Boiler Testing Pump**
1—**Fairbanks 2000 lb. Scale**
3—**4000 lb. capacity Yale & Towne Chain Blocks**, $75 each
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1—**Set 4-ft. Bending Rolls**, rolls 5½ in. diameter, (hand power)
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1—**Angle or Rail Bending** and straightening machine, size 6 in screw power
1—**Lot Wood Patterns** for boiler castings
1—**Lot Manila Rope**, steel and wood blocks
1—**Lot of Manhole Castings**
10—**Pneumatic Air Hammers and Snaps**
1—**Crane Trolley**
1—**Lot of Hand Tools**
2—**Rivet Forges**
1—**Hand Forge Blower**
1—**Wall Crane, double channels**, 12 ft. arm and attachments, with trolley
1—**Small Overhead Crane**, made of 8 in. double channels, 18 ft. span, with trolley
1—**Small Overhead Crane**, made of single 12 in. I-beam with trolley span 16 ft.
1—**Allen 72 in. Portable Pneumatic Hammer**, Boiler or Plate Riveter, capacity 1 in. rivets
1—**Allen Compression Lever Riveter**, 10 in. reach, 11 in. gap capacity ⅝ in. rivets
1—**Norwalk Straight Line High Pressure Air Compressor**, with primary and secondary air cylinders, making it two stage, 12 in. stroke, capacity about 250 feet free air per minute at 100 lb. pres.
1—**Overhead 12-ton capacity Hand Power TravelingCrane**, 26 ft. 8 in. span constructed of 15 in. I-beam ⅝ in. web, 6½ in. flange
1—**Overhead 10-ton capacity Hand Power Traveling Crane**, 26 ft. 8 in. span, constructed of 15 in. I-beam, ⅝ in. web, 6 in. flange
1—**Set of Flanging Clamps**, 12 ft. 8 in. clearance between housing screws, jaws 4½ in. thick.

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Sales Engineers
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1—6½ x 8 Monighan, D.C., 3-drum, price, $1000.
1—6½ x 10 National, D.C., D.D., with boiler, price $950.
1—7 x 10 American D.C., D.D., almost new, with boiler, price $1050
1—7 x 10 Lidgerwood, with boiler, price $990.
1—7 x 12 Marsh-Henthorn, D.C., 3-drum with boiler, price $1275.
3—7 x 10 Lidgerwood swinging engine, D.C., price $475.

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2—B. & W., 150-hp. boilers, guaranteed 150 lb. working pressure, each $1500.

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1—Marion "28," shop number 3361, ¾-yd. dipper, Ohio boiler, actual use 90 days, price $5100.
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1—25-ton, all steel derrick, 75-ft. boom, 65-ft. mast, with double "A" frame towers into which stiff legs are anchored, compound gear, double drums, with face paper friction, fitted for electric motor, price $2500.

We offer for immediate delivery the above equipment, and guarantee all to be exactly as represented.

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1—10 x 10, D.C., D.D., Clyde **Skeleton Hoist**
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4—6½ x 10, D.C., D.D., Mundy **Skeleton Hoists**
1—100-hp., D.D., Thomas **Electric Hoist**, D.C.
1—75-hp., D.D., Thomas **Electric Hoist**, A.C.
1—6-in. and 1—8-in. belted **Sand Pump**
1—5-in. and 1—6-in. direct connected **Sand Pump**
1—No. 7 and 1—No. 8 **Cameron Pump**
2—**Nye Pumps**
1—No. 2 Vulcan **Steam Hammer**
1—No. 14 Koehring **Street Paver**
1—25-hp. Garr-Scott **Traction Engine and Roller**, combined
1—1-yd. Hayward **Orange Peel Bucket**
400 ft. 2-in. **Strand Cable**
400 ft. 2-in. **Inlaid Cable**

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ROCK CRUSHERS AND CONCRETE MIXERS

In Stock—Ready for Delivery

ROCK CRUSHERS

1—30 in. x 13 in. jaw "Farrell."
1—24 in. x 13 in. jaw "Farrell."
1—No. 15 jaw, on wheels, with elevator and screen, "Champion."
1—10 in. x 16 in. jaw on wheels, with elevator, "Buchanan 'Reliance.'"
1—No. 4 jaw on wheels with elevator and screen "Champion."
1—No. 4 C. jaw on skids, with elevator, buckets and screen, "Champion."
1—9 in. x 15 in. jaw "Fraser-Chalmers."
1—No. 3 jaw, with elevator and buckets, "Champion."
1—No. 4 gyratory "McCully."
1—8 in. x 23½ in. pulverizing rolls, geared "Wolf."
1—36 in. x 12 in. crushing rolls, "Fraser-Chalmers."

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2—No. 24 "Lakewood" motor driven.
1—No. 60 "Ransome" gasoline driven.
1—No. 56 L "Big and Little" gasoline driven.
3—5 ft. "Big and Little" gasoline driven.
1—No. 7 "McKelvey," with engine and boiler.
1—No. 12 "Koehring," with engine and boiler.
1—No. 11 Cube "Municipal," with engine and boiler.
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Also a large stock of Hoisting Engines, Air Compressors, Pumps, and other Contractors' Equipment.

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Acme 11 x 20-in. Jaw Crusher on I beams and trucks. Rebuilt in Acme shops and guaranteed absolutely like new. Price $1350.

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Buffalo-Pitts 10-ton Roller, in A-1 working condition. Has had only three or four seasons' actual use. New about 1913. Price $2200.

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Farquhar 30-hp. Boiler, with Ajax 25-hp. engine. Mounted on trucks. New 1913 and run only part of one season. Any inspection or test. Price $1050.

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1—10-ton **Buffalo Combination Road Roller and Traction Engine.**
2—6-ton **Buffalo-Pitts Tandem Rollers.**
1—¾-yd. **Milwaukee Traction Concrete Mixer,** chute and boom and bucket.
1—6A **Foote Traction Concrete Mixer,** 22-ft. capacity.
20—2-yd. **Watson Dump Wagons.**
20—**Watson Wagons,** attachments for hauling with roller or engine.
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1—30-ton **Bin,** 24-ft. elevator and screens.
1—10 x 20-in. **Climax** Portable **Crusher,** complete with folding elevator, 35-ton bins and screens.
1—**Adams Combination Scarifier and Grader,** with adjustable engine pole.
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1—30-ft. **Climax Elevator,** complete, "new."
4—**Dump Carts** with **Harness.**
2—¾-yd. **Concrete Horse Carts.**
5000 ft. 1½-in. **W. I. Pipe.**
4—100-gal. **Tar Heating Kettles.**
1—**Monarch Oil Distributing Wagon.**
1—8 x 8 in. Channel lattice **Derrick,** 55-ft. mast, 51-ft. boom.

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One No. 3

CHAMPION CRUSHER

on wheels, with 20-hp. Engine and Boiler.

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CONCRETE MIXER

manufactured by Municipal Engineering & Contracting Company, of Chicago, capacity 11 cu.ft. mixed concrete, 24 yds. per hour, requires 7½ hp. for driving. *Machine in excellent condition.*

MOHAWK HYDRO-ELECTRIC CO., Inc.
Fort Plain, N. Y.

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ROCK CRUSHING PLANT

No. 5 Gates Gyratory crusher, screen with dust jacket, bucket conveyor, 60-ft. centers, 60-hp. internally fired boiler, 50-hp. and 20-hp. engines, quarry cars, rails, drills, and miscellaneous fittings.

1127 James Building, Chattanooga, Tennessee

GYRATORY CRUSHERS

1 Gates No. 12 3 Number 5 1 Kennedy 10
3 Kennedy 6 3 Austin No. 8½ McCully 7½

Locomotives, Cars, Cranes, Steam Shovels

J. F. DONAHOO CO., Birmingham, Ala.

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No. 6 Austin Gyratory Crusher, rear drive, corrugated head. Used three months. Too small for Cement plant. Bargain at $1700 f.o.b. cars, Altoona, Kansas.

Bargains in Nos. 2, 3, 4, 5 and 7½ Gates and Austin Gyratory Crushers, rebuilt, guaranteed first-class condition, our warehouse.

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16—1000-lb. capacity, plain trolley Electric Hoists, to run on 7-in. I-beam, height of lift 12 ft. 6 in., 220-volt, direct current.

LIFTING MAGNET

1—New 43-in. E. C. & M. Co.'s Lifting Magnet, complete with panel and switch, 220 to 250-D.C.

CLAMSHELL BUCKET

1—1¼-yd. Williams clamshell Bucket.

MACHINE BOLTS

Approximately six thousand new machine bolts, 7½-in. long under head by 1¼-in. in diameter with U. S. standard cold punched hexagon nuts.

THE FACTORY PRODUCTS CO.
203-204 Oliver Bldg., Pittsburgh, Pa.

IN LIQUIDATION:

1—McMyler Mfg. Co. 15-ton, 4-wheel **Crane,** with 1-yd. bucket, 50-ft. boom.
1—200-hp. Scotch Marine Water-back Type, **Boiler,** 200-lb. pressure, with 40-ft. stack.
1—Cochrane **Feed-water Heater,** 300-hp.
1—18 x 36 Hamilton RH Corliss **Engine,** fly-wheel 14-ft. x 20-in.
6—Steel Jacketed **Tanks,** 42 ft. long, 6-ft. 6-in. diameter, suitable for creosoting.
Quantity smaller **Solution Tanks,** 40 ft. long, 4 ft. diameter; others various sizes.
1—200-hp. Heine Water-tube Boiler, 150-lb. pressure.
1—Ingersoll-Rand NE-1 **Air Compressor,** 175-cu.ft., belt driven.
1—Lot Small **Pumps.**
1—800-gallon **Fire Pump.**
Large quantity extra heavy refrigeration **pipe, belting, shafting, pulleys,** etc.
2—Jackson Dry **Pans.**

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Good Condition—Prompt Shipment—Fair Prices

ELECTRIC DOUBLE DRUM HOISTS

2—30 hp. 6—50 hp. D.C., 220 volts.
5—Swinging Gears for same.
1—50 hp. A.C., 3 phase, 60 cycle, 440 volts.

STEAM HOISTS, SINGLE DRUM

1—3 in. x 4 in. 6—4½ in. x 6 in. Swinging Gears.

STEAM HOISTS, DOUBLE DRUMS (Without Boilers)

1—5½ in. x 8 in. 1—8 in. x 10 in.
2—6 in. x 8 in. 2—8 in. x 12 in.
1—6 in. x 12 in. 1—8¼ in. x 10 in.
2—7 in. x 10 in. (1 with L. M.
1—9½ in. x 10 in. (Link motion).
1—10 in. x 16 in.

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13,465 ft. ¾ in. (lengths 650 ft. to 2100 ft.)
14,585 ft. ⅞ in. (lengths 700 ft. to 1400 ft.
870 ft. ½ in., 870 ft.
4000 ft. ¾ in., ¾ in., never unreeled.
1200 ft. 1⅞ in. x 2 in. Plow Steel, Armored Rope.

(Waterbury) Never used.

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1—40 ton. 4—20 ton. 8—15 ton.

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Ingersoll-Sargent, Class JC, belt driven, 2 stage, 18¼ in. and 12¼ in. x 12 in., 526 cu.ft. at 150 r.p.m.
Hall, steam driven, 16 in. and 6½ in. x 14 in., 2 stage, air cylinders, 14 in. x 14 in., steam, rated by mfrs. at 500 cu.ft.
Norwalk, steam driven, 16 in. and 9½ in. x 16 in., 2 stage, air cylinders, 16 in. x 16 in., steam, cylinders, 558 cu.ft.

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1—300 hp. B. & W. Boiler, with Coppus Blower and guyed steel stack, 87 ft. x 60 in.

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1—14 in. x 20 in. Atlas R.H. Automatic Side Crank Engine, with band wheel 84 in. x 16 in.
1—12 in. x 20 in. Erie City, 4 valve, automatic engine.
1—35 hp. Buckeye, center crank, automatic engine.
1—6 in. x 12 in. Sherman, Vertical Engine (throttling).
2—6 in x 8 in. Nagle, Vertical Engine (throttling).

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1—Worthington Duplex Steam Pump, 5½ in.-3½ x 5 in.
1—No. 7 Pulsometer.

GEORGIA PINE TIMBERS

26—Pcs. 12 in. x 12 in., first-class, never used.
6—Pcs. 14 in. x 14 in., 30 ft. to 33 ft. lengths.

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1—15 ton Locomotive Crane (wood derrick type).

ELECTRIC STEEL TRAVELING CRANES, D.C. 220 volts.

1—30 ton, 75 ft. span.
1—15 ton and 5 ton, 60 ft. span.
1—15 ton, 40 ft. 9 in. span.
2—10 ton, 40 ft. span.

LANE TRUSSED WOOD FRAME CRANES, (Rope Drives)

1—10 ton, 29 ft. 6 in. span.
2—20 ton, 40 ft. span.
2—10 ton, 40 ft. span.
1—10 ton, 50 ft. span.

(Easily changed to electric drives.)

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2—G. E. Transformers, Type H, Form R, top, 60 cycle, Cap. 75 Kw., 6800/6700, —2200.
1—Stanley A.C., 2 phase Generator, 135 Kw., Type C, 900 r.p.m.
1—S. Morgan Smith, 14 in. Water Wheel, complete with case and draft tubes (no governor).

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Phone, Murray Hill, 4592

Twenty-two All Iron Trucks
Portable Jaw Stone Crusher

Twenty-two all iron trucks, suitable for brick yard or cement block plant. Length 7 ft. 6 in., width 25 in., gauge of track 24-in., diameter of wheels 11 in., roller bearing with springs, extra frames 13 in. high, trucks made out of 3-in. x 2-in. x ¼-in. angle. All above in good condition. Price $15 each f.o.b. Toledo, inspection here. One Champion No. 3 Portable Jaw Stone Crusher on wheels equipped with brakes and tongue, 14-ft. elevator and screen, weight 3½ tons. Good condition. Price $550 f.o.b. Toledo, inspection here. **THE JENNISON-WRIGHT COMPANY**, 2463 Broadway, Toledo, Ohio.

GYRATORY CRUSHER

1 No. 7½ Kennedy Gyratory Crusher.

Excellent condition. Actual service less than six months.

HOISTING ENGINE

1—12½ x 16-in. Flory double cylinder, double tandem, drum link motion Hoisting Engine.

Excellent Condition.

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July 4th issue

of

ENGINEERING NEWS-RECORD

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1—36-In. Symons Disc

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Complete (Electric)

CRUSHING PLANT

8, 6, and 5 Gates with Electric Shovel, etc., etc.

Boilers, Engines, Electric Equipment and Crushers

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1800 ton 70-lb.
250 ton 85-lb.
150 ton 40-lb.

Complete with angle bars and spikes for immediate delivery; 6 miles 36-in. gage, portable track, with steel ties, 20 and 25 lb.

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1—Marion Model 20 Steam Shovel, 1¼-yd. dipper
3—95-ton Bucyrus Steam Shovels, 5 cu.yd. dipper.
1—No. 14 railway type, ¾-yd. Marion Steam Shovel, ¾-in. revolving, independent crowding engine, slewing and hoisting engines. In good condition.

Lidgerwood Cable Way

1—Lidgerwood Cable Way, consisting of Lidgerwood, double cylinder, double drum hoist, 10 x 16 cylinders, 42-in. drums, with two towers, 1200 ft. 2-in. cable, complete set of file and button pins, steel and wooden skids.

Locomotive Cranes

1—20-ton O. & S., 8-wheel, 42½-ft. boom.
1—30-ton Industrial, 8-wheel wrecker, 32-ft. goose neck boom.
1—40-ton Bucyrus, 8-wheel, 55-ft. boom.
1—2-ton, 4-wheel railway type, 110-volt, storage battery electric locomotive Crane, boom 15 ft., full revolving, with motors and controllers.

Air Compressors

4—18 x 29 x 18-24 Laidlaw-Dunn-Gordon.
1—14 x 22 x 14-16 Chicago Pneumatic Tool Co.
50—9½ x 9½ x 10 Westinghouse air-cooled locomotive Compressors.
2—1200-ft. Ingersoll Imperial type, low duty 22 x 14 x 16 x 16.
1—16 x 16½ x 18 Ingersoll-Sergeant.

Water Pipe

50,000 ft. 1-in.
35,000 ft. 1¼-in.
65,000 ft. 2-in.
48,000 ft. 2½-in.
8,000 ft. 3-in.
15,000 ft. 4-in.
13,000 ft. 1½-in. double extra strong seamless Steel tubing; good for 5000 lb. pressure, fitted with Briggs threads each end, and couplings.

Large Pumps

3—16 x 10½ x 14-in. outside packed Knowles.
2—7½ x 5 x 10-in. Warren.
1—14 x 8½ x 10-in. Worthington.
1—16 x 10½ x 40-in. Worthington.
1—16 x 28 x 15½ x 30 Wilson Snyder Duplex Pump, with 10 x 14 x 28 jet condenser.
1—18 x 29 x 16½ x 18 Laidlaw-Dunn-Gordon compound Duplex Pump.

128 Page Machinery Bulletin mailed on request.

Harris Brothers Co.
Chicago

Locomotive Cranes, Air Compressors, Mine Hoists, Etc.

Ready for Shipment

LOCOMOTIVE CRANES

1—10 ton Industrial 4-wheel, single drum for fall block and hook work. Full steel housing.
1—20 ton Brownhoist, 8-wheel, 48-ft. boom, 2-yd. Clamshell.

LOCOMOTIVES

2—Baldwin, standard gage, saddle tanks; one 33-ton, the other 35-ton; cylinders of both 14 x 24; four driver type; Hunt's inspection certificate of approval furnished.

BOILERS

4—200-hp. (Heine type) water tube boilers.
1—Marine type, 100-hp. Freeman internal fired, portable boiler, diameter 84 in., length overall 18 ft., 125-lb. pressure.
1—30-hp. locomotive type, portable boiler and engine, mounted on iron wheels with engine mounted on top of boiler.
1—Closed steel upright storage tank, 10-ft. 6-in. diameter, 9 ft. 9 in. high, capacity 6000 gal.

BUCKETS

1—1-yd. capacity Dragline bucket.
1—¾-yd. capacity Orange Peel bucket.

MINE HOISTS

Lambert, 10 x 12 double cylinder, single drum, 35-in. dia., 24-in. face. Drum grooved, will take up ¾-in. cable. Drum flanges 8 in. deep. Link motion.

DERRICK HOISTS

2—Byers 16-hp. double cylinders, double drum, equipped with boilers and swinging gears.
2—7 x 10 Lidgerwood double cylinder, double drum, skeleton.

CONCRETE MIXERS

1—Standard 10-cu ft., gasoline driven, mounted on trucks, complete with loading platform.
2—Marsh-Capron, ½-yd. with steam engines and boilers mounted on wheels. Charging hoppers or side loaders.
1—Marsh-Capron 1-yd., mounted on steel skids—no power charging hopper, electric or steam power can be applied.
1—No. 4 Smith with steam engine on skids.
1—Lot concrete spouting, size 14½ in. wide 9½ in. deep; hopper connections.

CARS

4—1-yd. capacity, "V" shaped steel two-way dump, 30-in. gage.

AIR COMPRESSORS

Ing.-Rand duplex, two-stage steam driven; capacity, 1190 ft. air at 110-lb. pressure.
1—Rand belt-driven air compressor; capacity 300 ft. air at 100-lb. pressure.

WIRE ROPE

200 ft. ¾-in. (one piece) plow steel.
312 ft. ¾-in. (one piece) plow steel.
500 ft. ¾-in. (one piece) plow steel.
593 ft. ¾-in. (one piece) plow steel.
850 ft. ¾-in. (one piece) plow steel.
425 ft. ¾ in. (one piece) plow steel.
257 ft. ¾ in. (one piece) plow steel.

PORTABLE TRACK

About 500 ft. of 20-lb. portable track and rails in 15-ft. sections.

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1601 Monadnock Building, Chicago, Ill.

Will Sell Quick

1—Baker Macadam **10-ton Roller.**
1—Fort Wayne **Stone Crusher.**
1—**Jeffrey Drill,** complete.
1—6 hp. **Gasoline Engine.**
1—**Myers Pump.**
3000 ft. 2-in. **Water Pipe.**
1—100 bbl. **Water Tank.**
1—**O. K. Hoist.**
1000 ft. ½-in. **Cable.**
6—New **Wheel Scrapers.**
4—**Road Plows.**
12—**Slipps.**

Will sell outfit at a bargain.

H. D. CURTIS, Contractor
Stockport, Ohio

FOR SALE

1250-yd. **Cummer Asphalt Plant,** complete.
5—6-ton **Kelly-Springfield Road Rollers.**
3—1000-gal. **Asphalt Kettles.**
40-hp. **Boiler** and 30-hp. **Engine.**
Kinney Asphalt Pump, complete.
No. 14 **Koehring Concrete Mixer,** with bucket and boom.

THEODORE F. HUSSA
50 Church Street, New York, N. Y.

Paving Equipment

FOR SALE

2—No. 27-E (¾-yd.) Foote **Paving Mixers,** steam power, traction.
1—No. 5-A (½-yd.) Foote **Paving Mixer,** steam power, traction.
1—No. 14 (½-yd.) Chain-Belt **Paving Mixer,** steam power, traction, boom and bucket.

Also a complete road builders' outfit, consisting of tandem and three-wheel rollers, horse rollers, car unloading plant, 24-in. gage Koppel track and cars.

FOOTE CONCRETE MACHINERY CO.
1324 South Michigan Ave., Chicago, Ill.

FOR SALE

2—10-ton Monarch **Rollers.**
2—10-ton Buffalo-Pitts Macadam **Road Rollers.**
1—No. 11 Ransome **Street Paver,** steam power.
1—**Road Scraper.**
1—48½ x 7 **Boiler.**
4—**Sider Car Unloaders.**
1—**Cedar Tank.**
1—**Tool Wagon.**
1—**Gas Engine,** 4 x 3 **Centrifugal Pump.**
2—**Concrete Rammers.**
1 M. ft. **Concrete Forms,** road.
250 **Iron Stakes,** 20 in.

This equipment can all be seen at our yard at this address

SNYDER-PHILIPS COMPANY
273 W. Mt. Pleasant Ave., Philadelphia, Pa.

SEARCHLIGHT SECTION

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10—Davenport 50-ton Locomotives, 6-wheel switching type, 17 x 24-in. Cylinders.

2—Baldwin 50-ton Locomotives, 6-wheel switching type, 17 x 24-in. Cylinders.

DRAGLINES

3—Bucyrus Class 24 Dragline, 100-ft. boom—Bought for work that was cancelled.

RAILS

1500 tons 65-lb. A. S. C. E. Section.

WESTERN AIR DUMP CARS

50—16-yd. 26-ft. bed, 31-ft. 6-in. over all.

30—12-yd. 26-ft. bed, 31-ft. 6-in. over all.

20—12-yd. 19-ft. bed, 24-ft. over all.

The above equipment is in first-class condition. Located at Montreal and Halifax for immediate delivery.

COOK CONSTRUCTION COMPANY, Limited
406 McGill Bldg., Montreal, Canada

Sound Plant in Good Operating Condition For Sale

AIR COMPRESSORS

2—Ingersoll-Sergeant Class A, 18 x 18½ x 24 Straight Line, steam-driven, 650 ft. per minute at 100 lb.
1—Rand Duplex, steam driven, 600 ft. capacity with receiver.

BOILERS

4—50-hp. locomotive type.
7—Vertical tubular. 1—12-hp. 1—15-hp. 1—40-hp.

CABLEWAY

1—Lambert, 6-ton, 900-ft. span.

CONCRETE MIXERS

2—Ransome, 1-yd. on skids, with steam engine, but no boiler.

CENTRIFUGAL PUMPS

1—10-in. Buffalo, double suction, belt driven.
1—15-in. Buffalo, belt driven.
1—20-in., belt-driven Worthington Turbine.

FIRE PUMP

1—Worthington Duplex Fire Pump, 18½ x 9¼ x 10, capacity 610 gallons per minute.

DUMP CARS

6—4-yd. Western, extra heavy, 36-in. gage.
20—3-yd. Peteler, 36-in. gage.
20 pairs of wheels and axles, for 4-yd. Western, extra heavy, brand new.

ROCK DRILLS

100—McKiernan-Terry "Wizard" Rock Drills, 2¼ to 3-in., with tripods for air or steam, all brand new.

HOISTING ENGINES

1—10 x 12 Lidgerwood compound geared to drum 41 x 52-in. Has 25-ton pull. Suitable for mine work.
2—American, 7 x 10, double cyl., 2 drum, with boom swinger, but without boiler.
2—American 7 x 10 double cyl., 2 drum, with boom swinger, with boilers.
1—5½ x 8 American, double cyl., 2 drum with boom swinger, with boiler.

CONCRETE FORMS

1600-ft. Blaw Concrete Forms, flat.

Locomotives, Drills, Pumps, Steam Shovels, Etc.

All thoroughly overhauled and ready for immediate and constant service.

UNITED STATES EQUIPMENT CO, 208 South La Salle Street, Chicago

---

EQUIPMENT—BARGAINS

ENGINES AND HOISTS

7—Slide valve, right hand, 14 x 18-in. Erie Engines, complete with 60-in. flue wheel, 6-in. face, 180-r.p.m., complete with governors, cylinder oilers, sight feed oil cups, drip valves, exhaust pipes, and gate valves.

connected to

7—Slow speed, twin drum Hoists, 30 in. in diameter, 17¼-in. face, 3 11/16-in. bore, hubs oil grooved, geared to 65-in. cast iron gears, with 4-in. face. Complete with oilers, run on plain shaft, 2 11/16-in. diameter, 7 ft. long, drums not scored.

CONVEYOR CHAIN

Good as New

2100 ft. Forged Steel, 6 in. "Maximum" Chain, 300-ft. lengths.
3600 ft. Dodge Chain, bar 7/8 in. diameter, 8¼-in. pitch, made of forged steel, 250-ft. lengths.

BOILER

125-hp., triple Butt Strapped Boiler, 66 in. in diameter, containing 54 4-in. tubes, allowed 125 lb. steam pressure, perfect condition, complete with all the usual fittings.

STERLING IRON & STEEL COMPANY
10th and Hamilton Sts., Philadelphia, Pa.

SEARCHLIGHT SECTION

Clam-Shell Buckets

FOR SALE FOR RENT

New and Rebuilt

Rental on ½ and ¾ yd. Buckets $2.75 per day
Rental on 1 and 1½ yd. Buckets $3.25 per day

Send for catalog

George Haiss Mfg. Co.
140th St. and Rider Ave. New York City

FOR SALE

STEAM HAMMER

1—McKiernan-Terry, No. 3.

DUMPING BUCKETS

4—1-yd. Stuebner.
4—½-yd. Stuebner.

DRYER

1—Ruggles-Coles Single Shell

CHARLES T. EASTBURN, Agent
Yardley, Buck County, Pa.

FOR SALE

GRAB BUCKET

For Immediate Delivery

New full 2½-yd. two-line
Equipped for Derrick use.

BUFFALO CONTRACTORS' PLANT CORP'N
Buffalo, N. Y.

FOR SALE

Immediate Delivery

ERIE SHOVEL

¾-yd., traction wheels, located Correctionville, Iowa, complete, shop number 167, price **$5100.**

CHESTER A. PHILLIPS & CO.
970 Old Colony Bldg., Chicago, Ill.

FOR SALE

STEAM SHOVEL

Thew Type O. In good condition. Located near Paterson, N. J. Price $2700 cash.

JOHN T. HARROP CO.
Garfield, N. J.

THEW TYPE O STEAM SHOVEL

Full revolving, on traction wheels, ¾-yd. dipper. Shop No. 1415. Has the combination boom. Bought new 1917, used but four months; practically new.

Price, $5500 f. o. b. Akron, Ohio

Have five others, same size, from $3500 up.

WM. B. GRIMSHAW CO.
1040 Drexel Bldg., Philadelphia, Pa.

STEAM SHOVEL

1—Thew, Type O. Rebuilt and ready for immediate delivery.

JAMES S. BRADEN
26 Cortlandt St., New York

FOR SALE

BUCYRUS SHOVEL

18-B Shop No. 1660 Traction Wheels

Excellent Operating Condition

SYKES COMPANY Columbus, Ohio.

Get your Wants into the Searchlight

SHOVELS

Thew ⅝-yd. Steam **Shovel**, full rev., needs repairs; a bargain, $1800.

Marion-Osgood ⅝-yd. Steam Shovel, full rev. traction, $4000.

SCRAPERS

3 Improved Steel Champion Road **Scrapers**, little used, each $160.

Carts, Trucks, Wheel Barrows, Picks, Brick Wagons, Builders' Hoists, Concrete Mixers, Pumps, Koppel Cars, Boilers, Etc.

C. E. BRASEFIELD
Shop, Office, Yard: Moorestown, N. J.
Philadelphia Office: 1314 Arch St.

REBUILT PLANT

For Sale, F.O.B. Philadelphia

2—100-hp. Locomotive Type **Boilers**
1—125-hp. Locomotive Type **Boilers**
1—807-cu.ft. **Air Compressor**
3—No. 2 Vulcan **Pile Hammers**
4—2500 to 3000-lb. **Drop Hammers**
1—12 x 7 x 14 Duplex **Pump**
1—3½ x 2 x 3 Feed Water **Pump**
1—9-cu.ft. **Orange Peel Bucket**

JARRETT-CHAMBERS COMPANY, Inc.
30 East 42nd St., New York

Offered for Quick Sale

Machinery, Contractors' Equipment and Supplies, used by City of Cleveland in Tunnel Construction

1—2-ton Brown, 2 motor **Electric Hoist and Transporter**, 110-volt, D.C.
1000 ft. 8-in. **Monorail I Beams**, with our switches.
2—¾-yd. Insley Auto **Bottom Dump Buckets.**
2—No. 3 2-wheel **Road Scrapers.**
2—1250 ft. Ingersoll-Rand, Imperial Type 10, steam driven **Air Compressors**, steam cylinders, 22 and 14 in.; air cylinders 16 in., stroke 16 in.
2—5-ton Porter Compressed **Air Locomotives**, 24-in. gage.
27—Hydraulic **Tunnel Jacks**, 8½ x 32 in.
1—Dean Hydraulic Duplex **Steam Pump.**
1—**Hydraulic Accumulator**, 5000-lb. pressure.
13,000 Ft. 1½-in. double extra strong **Hydraulic Pipe.**
118—24-in. gage K. & J. **Contractors' Cars**, roller bearing.
67—24-in. gage Atlas Industrial **Flat Cars.**
2—Rotary **Car Dumpers.**
5000 ft. 25-l.. **Rail.**
2000 6 x 8 x 42 and 72-in. Industrial **Track Ties.**
1—¾-yd. Ransome Portable **Concrete Mixer**, with engine and boiler.
1—No. 4 Champion Portable **Jaw Crusher** with 18-ft. elevator jaw opening, 9 x 15 in
1—15-hp. Fire Box **Boiler** on wheels, with engine mounted on top.
2—150 Cookson **Feed Water Heaters.**
48—10-ft. diameter steel **Concrete Forms**, 18 in. wide.
45—14-ft. diameter **Steel Cylinders**, made of 1-in. plate.
1—1-yd. Orange Peel **Bucket.**
6500 ft. standard four **Conductor** No. 18 B. & S. gage.
Lead covered armored **Telephone Cable.**
27,000 lb. rubber covered **Copper Wire**, sizes Nos. 0, 2, 4, 6 and 8.
1—8 x 12-ft. Horizontal Round Steel **Air Tank.**
1—7 x 10-ft. Horizontal Round Steel **Air Tank.**
2—60-in. x 14-ft. Horizontal Round Steel **Air Tanks.**
1—60-in. x 8-ft. Horizontal Round Steel **Air Tank.**
3—7½ x 4½ x 6-in. Worthington Duplex **Steam Pumps.**
3—5½ x 3½ x 5-in. Worthington Duplex **Steam Pumps.**
3—20-ton Chisholm & Moore **Chain Hoists.**
1—20-ton Chisholm & Moore **Chain Hoist.**

L. GREENBERG, 1009 Schofield Bldg., Cleveland, Ohio

SEARCHLIGHT SECTION

FOR SALE—IMMEDIATE DELIVERY

Owned By Us and Sold Under Absolute Guarantee

STEAM SHOVELS

3—70-C Bucyrus, shop numbers 1474, 1126, 1287, 2¼-yd. dippers.
1—Standard 70-ton Bucyrus, shop number 733, 2¼-yd. dipper.
2—45-C Bucyrus, shop numbers 1297, 1202; 1¼-yd. dippers.
1—85-C Bucyrus, shop number 1649; 4-yd. dipper.
1—95-C Bucyrus, shop number 1304; 5-yd. dipper.

DRAG LINES

1—Lidgerwood all-steel steam dragline, on skids and rollers, 60-ft. boom, 2-yd. Page bucket.
1—Class-24 Bucyrus, all steel, steam drag line, shop number 722; mounted on skids and rollers, 100-ft. boom; 3¼-yd. bucket; equipped with electric lighting plant; also equipped with two extra buckets, in addition to a large amount of extra parts.

DUMP CARS

45—16-yd. standard gage Western air dump cars, with steel lined floors.
9—6-yd. Standard Gage K. & J., side dump cars
100—3-yd. and 4-yd., 36-in. gage cars.
30—1½-yd. 24-in. gage.
7—Heavy duty, 4-yd. Western, 36-in. gage dump cars.

REVOLVING TRACTION SHOVEL

1—14 B, Bucyrus, shop number 1803, ¾-yd. dipper. Shovel has never moved over 18,000 yd. of light material and is same as new.
1—Type "O" Thew, shop number 1002; ¾yd. dipper. Right out of service.
1—25B Bucyrus, shop number 1850; 1½-yd. dipper, with extra long dipper arm and ¾-yd. dipper in addition to standard equipment.

LOCOMOTIVES

1—17 x 24 cylinder 6-wheel switcher with separate tender, weight on drivers, 44 tons, steam pressure 140 lb. Thoroughly overhauled.
2—11 x 16, 36 in. gage, late type Davenport Locomotives.
1—18 x 26, 8-wheel passenger type locomotive, Schenectady build; total weight 51 tons; weight on drivers 33 tons.
5—36-in. gage, 10 x 16 Davenport saddle tank locomotives.
1—7 x 12-in., 24-in. gage Davenport, shop number in the twelve hundred.
2—36-in. gage, 10 x 16, Vulcan Saddle Tank Locomotive.
2—36-in. gage, 9 x 14, Davenport saddle tank locomotives.
1—36-in. gage, 9 x 14, Baldwin saddle tank locomotive.

RAIL, SWITCHES, SPIKES, ETC.

30—Complete Switches for 60-lb., 70-lb. and 75-lb. rail; complete with target switchstands, frogs, points, etc.
1—Carload 4½-in., 5-in., and 5½-in. spikes.
10-Ton angle bars for 70-lb. and 75-lb. rail.
100-Tons 52-lb. rail.
35-Tons 20-lb. rail with splices.
40-Tons 60-lb. rail with angle bars, practically new.

SPREADER CAR

1—Standard Western spreader.

HOIST

1—8½ x 10, double cylinder, double drum American hoist, with boiler, practically new.

SHOP EQUIPMENT and BOILERS

1—16 x 16 x 18-in. Laidlaw-Dunn-Gordon Air Compressor with reservoir, weight 15,000 lb.
1—Stationary Engine; horizontal center crank type; 10 x 12-in. cylinder, slide valve type; 25 H.P.
2—Brownell 72-in. x 18-ft. Horizontal Tubular Boilers, 4-in. tubes.
1—20 x 22½ x 14½ x 21 A A-2 Compressors, complete.
1—66 x 18 vertical Air Receiver, complete with fittings.
1—30 x 6 vertical Air Receiver.

All of the above Ingersoll-Rand Co.

CLAPP, NORSTROM & RILEY EQUIPMENT CO.
12 and 14 South Canal St., Chicago, Illinois

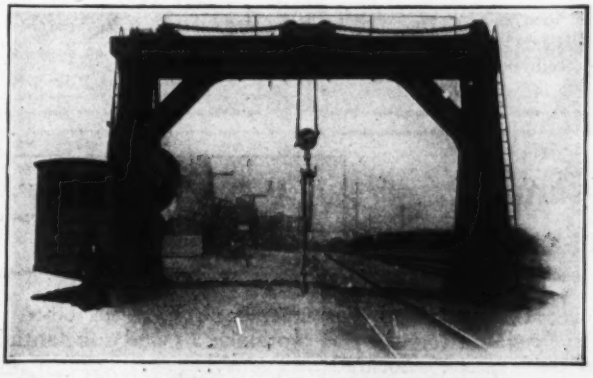
Northwestern Branch: 1308 Pioneer Building, St. Paul, Minn.

25-ton capacity Gantry Crane

Steam Operated

Immediate Shipment

Practically New Condition



GENERAL EQUIPMENT COMPANY
30 Church Street, New York City

HOISTS

Electric, Gasoline and Steam, S.D., Reversible
6, 8 and 10-hp. Novo, single drum, gasoline
6 x 8, S.C.S.D., steam, with boiler
5 and 7½-hp. reversible brick hoist, electric
82-hp., D.D., electric, A.C.

CONCRETE MIXERS

5-ft. Boss, with 3-hp. Novo engine
½-yd. Milwaukee, batch hopper, with pulley
½-bag Smith, steam engine and boiler
No. 131 Smith, 1½-yd. capacity, batch hopper, with or without 3-phase, 60-cycle motor, like new
New Mixers at reduced prices from Louisville stock

DERRICKS

1—Byers, self-propelling Steel Derrick Car, 20-ft. gage, 45-ft. boom, ¾-yd. bucket, nearly new. Complete ready to ship.
Stiff-leg Traveling Derrick, boom 14 x 14 x 73 ft., with bull wheel, blocks, rail, etc., good condition, cheap, Evansville, Ind.

MOTORS

50-hp., 3-phase, 60-cycle, 220-volt, G. E., slip-ring 900-r.p.m., with controller, $750
2—27-hp., 220-volt, D.C., Type CO, G. E., nearly new, each $225
2—20-hp., 220-volt, D.C., Type CO, G. E., nearly new, each $175

MISCELLANEOUS

11 x 26 Ft. Wayne Jaw Crusher, with screen,
Oshkosh Portable Saw Rig
10 x 10 Smith-Vaile Air Compressor
Air Pressure Tanks up to 48 x 13½ ft.
Jack-hammer Drills
5-ton Whitcomb Gasoline Locomotive, 36-in. gage
Emerson, Jr., 4-in. discharge Steam Pump
Concrete Tower Buckets, Hoppers, Chutes
1 and 1½-yd. Excelsior Bottom Dump Buckets
1-yd. Round Tip-over Buckets
Cableway Carriage
525 ft. 1½-in., 6 x 19 Wire Rope
Carbic Lights
Novo Equipment

New Equipment in Stock

ROY C. WHAYNE SUPPLY COMPANY
Louisville, Ky.

SEARCHLIGHT SECTION

LOCOMOTIVES
Standard and Narrow Gauge
CRANES
Locomotive, Gantry and Stiff-Leg
STEAM SHOVELS
Marion, Bucyrus and Thew
STEEL RAILS
New and Relaying
FROGS AND SWITCHES
Special yard turnouts for all sections of rail
CARS
New and Second-hand
SEWER PIPE
All sizes
AMERICAN RAILWAY EQUIPMENT CO.
Diamond Bank Building, Pittsburgh, Pa.

IMMEDIATE DELIVERY
FLAT CARS

20—60,000 lb. capacity, 37-ft. x 9-ft. x 4½-in.
2—60,000 lb. capacity, 36-ft. x 9-ft. x 6-in.
3—60,000 lb. capacity, 37-ft. x 9-ft. x 6-in.
1—60,000 lb. capacity, 34-ft. x 9-ft. x 4-in.

Thoroughly rebuilt and overhauled throughout, in first-class M.C.B. and I.C.C. Interchange condition in every particular.

RAILS **FOX BROS. & CO.** 126 Lafayette St., New York City **LOCOMOTIVES**

GASOLINE LOCOMOTIVE

5-ton **Whitcomb**, 36-in. gauge mine type. Bought new 1912; used about two years; now in first-class condition.

Price $1675, f.o.b. Scranton, Pa.

WM. B. GRIMSHAW CO.
1040 Drexel Bldg., Philadelphia, Pa.

FOR PROMPT SHIPMENT

300-ton, 70-lb. A.S.C.E. **Relaying Rail**, with angles, 70-lb. Frogs and Switches; 20,000 6 x 8-in. x 8-ft. **Used Ties**, good condition, for immediate delivery from Northern Ohio.

Also Contractors' Equipment of all kinds.

T. J. LANE EQUIPMENT CO.
24 Bushnell Bldg., Springfield, O.

FOR SALE

LOCOMOTIVE

10-Wheel Baldwin 19 x 24 cylinders, also

2—6-wheel, fifty-ton Baldwin ***switchers.***

Immediate Delivery

EQUIPMENT CORPORATION OF AMERICA
501 Stock Exchange Building, Philadelphia, Pa.

LOCOMOTIVES

Narrow and Standard Gage for every service, rebuilt, immediate delivery.

Locomotive Cranes, Steam Shovels, Cars, Etc.

SOUTHERN IRON & EQUIPMENT CO
Atlanta, Georgia

LOCOMOTIVES

FOR SALE

1—6-wheel switcher with tender.
1—6-wheel saddle tank switcher.
Both 45 tons weight.

Also 4—36-in. gauge 14-ton Porter dinkeys.

All in good condition.
Exceptional bargain.

Address
Owner, Lock Box 1730, Pittsburgh, Pa.

FOR SALE

5—Miles Koppel Portable **Rail.**
40—1½-yd. **Cars**, 24-in. Gauge.
2—Davenport **Locomotives.**
3—**Road Rollers.**
1—**Concrete Mixer.**
1—Galion 18-ton **Stone Unloader.**
2—Port Huron **Reversibles and other road-building equipment.**

W. H. KNAPP, Monroe, Mich.

FOR SALE
AT BELTON, TEXAS
19—**Oliver**, 12-yd., 2-way Hane
DUMP CARS
W. B. SWARTWOUT
728-33rd Street, Milwaukee, Wis.

6—¾-yd., 24-in. gage **Koppel Cars**, practically new, $65 each.
2—Miles 20-lb., 24-in. gage **Industrial Track**, 70c. per ft.
2—20-lb., 24-in. **Switches**, $40 each.
2—**Turn Tables**, $15 each.
1—20-hp. Byers friction screw, D.C., triple drum **Hoisting Engine**, with Dake swinger and Ohio standard boiler, $1400, Cleveland.
1—**Skid Derrick** 54 ft. boom with 7 x 10 D.C., triple drum, Lambert Hoist, Michigan Standard Boiler, Stroudsburg Swinger, ¾-yd. type L Owen Bucket, for $3000. F.O.B. Detroit
1—25-hp. **Byers**, D.C., D.D., toggle friction, rebabbitted, new flues. State test, 100 lb., $800, Cleveland.
1—10-ton Kelly-Springfield **Roller**, $1350.
1—2½-yd. Hayward Orange Peel **Bucket**, $1200.

THE DAY & MADDOCK CO.
Cleveland, Ohio

RAILS

We have on hand at all times large tonnage of relayers—practically all sizes.

ATLANTIC EQUIPMENT CO.
149 Broadway, New York, N. Y.

GASOLINE LOCOMOTIVE

FOR SALE

1—3-ton Plymouth, 24-in. gage, about one year old. (Hunt's inspection report furnished.)

MILLER-CRIPPEN EQUIPMENT CO., Inc.
418-419 First National Bank Bldg., Syracuse, N. Y.

RAILS

All sections, new and relaying.

For immediate shipment.

M. K. FRANK, Frick Bldg., Pittsburgh, Pa.

Passenger Cars

E. H. WILSON & COMPANY
COMMERCIAL TRUST BUILDING
PHILADELPHIA

Five standard gauge passenger cars, 46-ft. to 60-ft. body, particularly suited for carrying workmen. Good substantial cars at reasonable price. Located in Pennsylvania.

New and relaying rails of various sections, portable track, dump cars, etc., at our Chester, Pa. yard.

SEARCHLIGHT SECTION

Contractors' Equipment

For Immediate Delivery

DUMP CARS

40 Western standard-gauge, 12-yard, 2-way Dump Cars; 19-ft. beds; steel underframe; with or without air dump.

8—Oliver 36 in.-gauge 8-yard double-truck 2-way Dump Cars; thoroughly rebuilt; new beds and underframes.

9—K. & J. standard-gauge 6-yd. 2-way Dump Cars; thoroughly rebuilt.

DINKEY

1—10 x 16 Porter 18-ton, 36-in.-gauge Dinkey, built 1911; splendid condition.

PILE DRIVER

1—No. 5 Interstate Railroad Pile Driver, 40-ft. Pendulum Leaders, thoroughly rebuilt, splendid condition.

We have a large stock of other equipment.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

FOR SALE

170—Sections of 24-in. gage **20-lb. Track**, x 15 ft. long

2—Sections of 24-in. gage **20-lb. Switches**, x 15 ft. long

8—Two-way dump **Koppel Cars**, 24-in. gage 36 cu.ft. capacity

1—Z-yd. **Foote Steam Mixer** on wheels with loading hooper

1—Marion Model 28 **Steam Shovel** on Traction

This equipment is in very good condition and has been in operation on and off for about two years.

JAMESTOWN CONSTRUCTION CO.
60 River St., Jamestown, N. Y.

RAILS

For shipment from Cleveland

NEW RAILS		RELAYING RAILS	
12 lb.—100	tons	30 lb.—100	tons
16 lb.—125	"	35 lb.—100	"
20 lb.—130	"	40 lb.—100	"
25 lb.—175	"	56 lb.—150	"
30 lb.—180	"	60 lb.—100	"
40 lb.—140	"	70 lb.—250	"
Railroad Ties		75 lb.—300	"
		80 lb.—900	"
		85 lb.—725	"

THE FISHEL & MARKS CO.
CLEVELAND, O.
Pittsburgh Detroit Chicago

---

250 Tons

60-lb. Relaying Rails

300 Tons

67½-lb. New Rails

200 Tons

85-lb. New Rails

HENRY LEVIS & CO.
Commercial Trust Bldg., Phila., Pa.

RAILS

We have for immediate shipment

5 miles of 30-lb. relayers, at Atlanta, Ga.
2 miles of 35-lb. relayers, at Atlanta, Ga.
3 miles of 40-lb. relayers, at Wadley, Ga.
" miles of 56-lb. relayers, at Chicago, Ill.
8 miles of 56-lb. relayers, at Southern points
5 miles of 85-lb. relayers, at Chicago, Ill.

EQUIPMENT

LOCOMOTIVES STEAM SHOVELS
LOCOMOTIVE CRANES
DUMP CARS SPREADER CARS
PASSENGER AND FREIGHT CARS

Get our prices on anything you may want in the way of Rails or Equipment. It will pay you

THE ISAAC JOSEPH IRON COMPANY
525 Reading Road, Cincinnati, O.

WE OFFER FOR SALE

Prompt Shipment

RAILS

41	tons	16-lb. New Rails
110	tons	20-lb. New Rails
68	tons	25-lb. New Rails
470	tons	30-lb. Relayers
260	tons	40-lb. New Rails
420	tons	60-lb. New Rails
360	tons	80-lb. New Rails
420	tons	85-lb. Relayers

Also necessary joints for all above rails in stock.

MORRISON & RISMAN
Rail Department
Buffalo, N. Y.

---

85 lb. A.S.C.E. Relayers

16,000 tons—with Angle Bars to match.
Available immediate shipment and centrally located.
We positively own these Rails and offer same in carload lots and over.
25,000 tons—Relayers—sizes 25 lb. to 100 lb. in stock at our Pittsburgh Yards and vicinity. Immediate shipment guaranteed and prices very attractive.
Carload and less than carload inquiries and orders solicited.
Rails cut to length for structural purposes.
Frogs, Switches, Bolts, Nuts, Spikes and all Accessories.

L. B. FOSTER COMPANY
Park Building, Pittsburgh, Pa.

18-Ton DINKEY LOCOMOTIVE

10 x 16-in. Porter, 36-in. gauge. Has the full extended saddle tank and steam brake. Built 1906; just overhauled at a cost of about $1000, including turning of tires, retubing of boiler, etc. Ready for shipment.

Price, $2750 f. o. b. Chester, Pa.

We have several others, smaller and larger, at prices to "fit your pocketbook."

WM. B. GRIMSHAW CO.
1040 Drexel Bldg., Philadelphia, Pa.

HOISTING ENGINES

1—Lidgerwood, 14 x 18, D.C., three-tandem drum, suitable for cableway.
1—Shannon, 7¼ x 10, D.C., D.D., with boiler.
1—Mundy, 6¼ x 10, D.C., D.D., skeleton.
2—Mundy, 6¼ x 10, D.C., D.D. with boilers.
1—National, 5½ x 10, D.C., D.D., with boiler.

BOILERS

3—American-built Scotch type marine boilers, 12 ft. 6 in. dia. x 20 ft. long, double end, three corrugated furnaces each end, 160 lb. steam.
1—350-H.P. horizontal return tubular boiler, 125 lb. steam.

STEEL BUILDING

100-ft. x 70-ft., practically new, 6-bays 16 ft. 8 in., 39 ft. in clear.

ANCHORS

10—New Mushroom Anchors, 5,000 lb. each.

PIPE

6000 ft. strictly first-class 6-in. wrought steel pipe, equally as good as new.
700 ft. strictly first-class 20-in. dia. steel riveted flange pipe, lengths 20 ft. each.
400 ft., 24-in. dia., 30-ft. lengths, equally as good as new.

STATIONARY ENGINE

1—350-hp. Green Slide Valve Engine, equally as good as new, size 22 x 48 in., wheels 16 ft. x 3 in.

STEAM SHOVELS

1—55-ton Bucyrus, 2½-yd. dipper, standard gage.
1—No. 1 Thew traction steam shovel, ¾-yd. dipper.

CENTRIFUGAL PUMPS

1—Morris No. 12, 14-in. suction, 12-in. discharge, direct connected to horizontal engine, 18 x 10, 4500 gallons capacity per minute.
1—Belt-driven, 8-in. suction, 6-in. discharge, 1000 gallons capacity, 125-ft. head.

CAR TRUCKS

34—4-wheel standard gage car trucks. Wheels 24-in. diameter, in first-class second-hand condition.

RAILS

600 tons strictly first-class 30-lb. relaying rails with 4-hole angle bars.
We have a large tonnage of all-weight rail from 20- to 100-lb. relayers, pass any inspection.
1—Logging Engine, size 7 x 10, double cylinder, double drum, with boiler.
1—36-in. gage, 28-ton Climax Locomotive, North Carolina delivery.

HENRY A. HITNER'S SONS CO.
Station K, Philadelphia, Pa.

FOR SALE—About 10 tons 60-lb.
RELAYING RAILS
One 150 H. P. H. T.
BOILER
Few Tanks, Engines, Pumps, etc.
R. W. TRAYLOR
139 Clinton Avenue, Jersey City, N. J.

SEARCHLIGHT SECTION

STEEL PILING
SECOND HAND

Partial List

Lackawanna, 12¾ in. and 14 in. x ⅜ in.

130 pcs. 10 ft. long	80 pcs. 24 ft. long
220 pcs. 12 ft. long	300 pcs. 30 ft. long
160 pcs. 16 ft. long	275 pcs. 35 ft. long
185 pcs. 18 ft. long	110 pcs. 40 ft. long
85 pcs. 20 ft. long	110 pcs. 40 ft. long

United States, 12¼ in. x ⅜ in.

125 pcs. 14 ft. long	225 pcs. 20 ft. long
130 pcs. 15 ft. long	185 pcs. 24 ft. long
150 pcs. 18 ft. long	145 pcs. 40 ft. long

Wemlinger, 12 in. x ⅜ in. and 7/16 in.

200 pcs. 4 ft. long	250 pcs. 12 ft. long
70 pcs. 6 ft. long	225 pcs. 20 ft. long
150 pcs. 8 ft. long	300 pcs. 24 ft. long
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We guarantee all piling shipped by us.

Wemlinger Steel Piling Company
149 Broadway, New York City
"The Steel Piling Exchange"

3—20 cu.ft. Smith **Mixers**, gears for electric or pulley for belt drive.
20—No. 3 Sterling Concrete **Carts**
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1—Gasoline **Compressor**, Fairbanks 60 cu.ft. air at 100 lb.
1—¾ **Haiss Clamshell**
1—1-yd. Haiss **Clamshell**
1—1½-yd. **Hayward Orange Peel**
1—1-yd. **Smith Orange Peel**
1—7 x 10 **Lidgerwood Skeleton Hoist** with direct connected swingers, D.D., D.C.
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Buckets	Hammer
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The undersigned offers for sale, at Powell, Bradford County, Pa., two bridges, one a two-span structure, the other a single-span structure, all consisting of one hundred (100) feet through Pratt truss pin connected spans. These bridges weigh approximately fifty-two (52) tons to the span, or a total of one hundred and fifty-six (156) tons in the lot.

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88 pcs. 12-in. x ⅜-in. x 27-ft. U. S. sheet piling.

100 pcs. 14-in. x 40-ft. Lackawanna arched web sheet piling.

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1—50-ton Vilter
REFRIGERATING PLANT
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STEEL BUILDING
75 x 150 ft. and about 40 ft. high to roof trusses
For full particulars and price apply to
M. J. HUNT
1316 Beach Street, Philadelphia, Pa.

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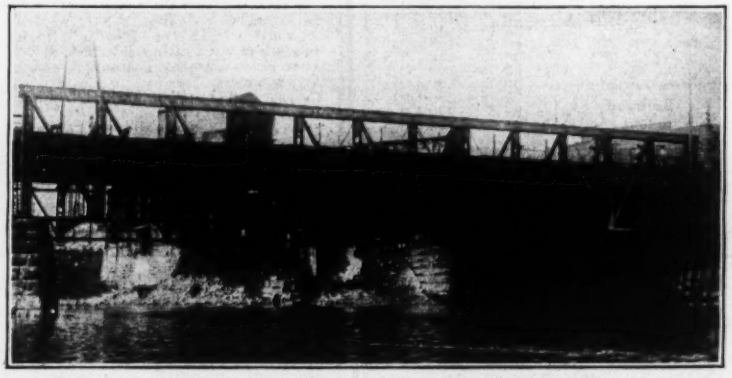
For Sale For Immediate Delivery



We have for sale for delivery at once one span of the West Broad Street Bridge over the Scioto River at Columbus, Ohio. This bridge is designed for heavy street traffic and is in fine condition. The length of span is 165 ft. on centers, the roadway 60 ft. clear, one 12 ft. cantilevered sidewalk with ornamental hand rail. The roadway may be reduced to any desired width by shortening floor trusses or substituting beams. There are 21 lines of steel I-beams including four 12 in. beams for supporting street car rails. This bridge is heavy enough for any Street, Railway, Electric Railway or light Steam Railway traffic.

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"HOOKED 'ER TO THE BILER"

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ALL TROUBLES ARE OVER FOR THEM.

Elevator troubles, of course.

No more, "Consarn it, she's busted agin."

No more * * * bad langwidge out in the mill.

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No more broken legs.

No more, "Killed three and hurt seven."

No more chills up the back.

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When you see the great plants all over the land busy getting Ridgway Elevators it don't take a Yankee to guess there is lots in that yell of ours

"Hook 'er to the Biler"

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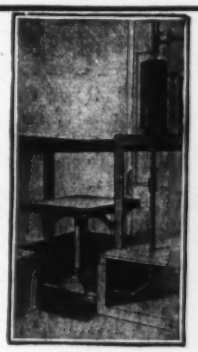
ELEVATOR MAKERS TO FOLKS WHO KNOW



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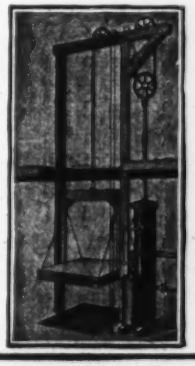

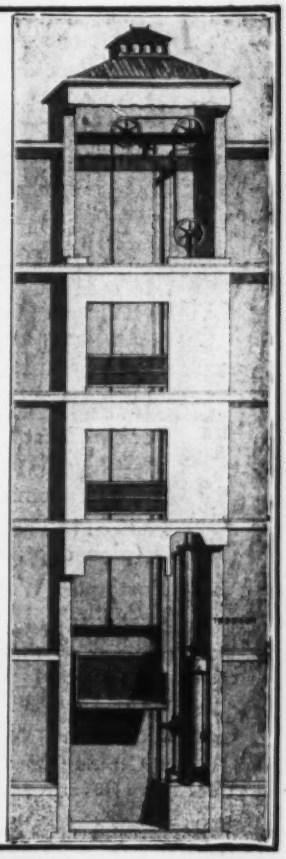

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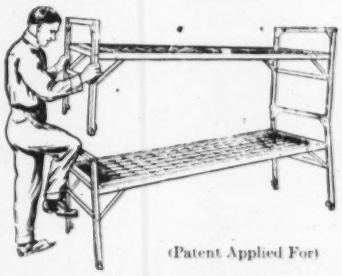

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Let us send you particulars

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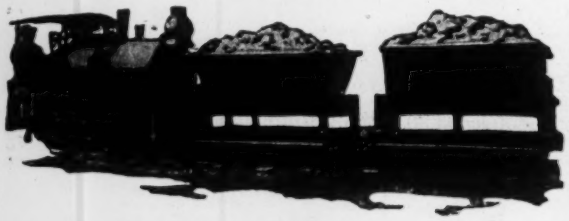

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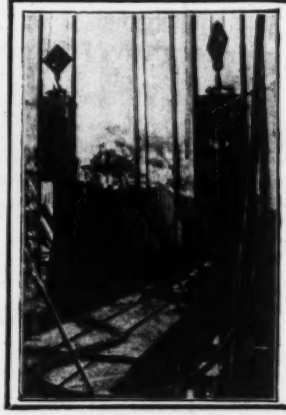
If you are in the market for a small locomotive. That opportunity to tell you why the Bell should be your locomotive cannot but result in mutual appreciation. Today is a good time to write.

BELL LOCOMOTIVE WORKS, Inc.
30 Church St., New York City



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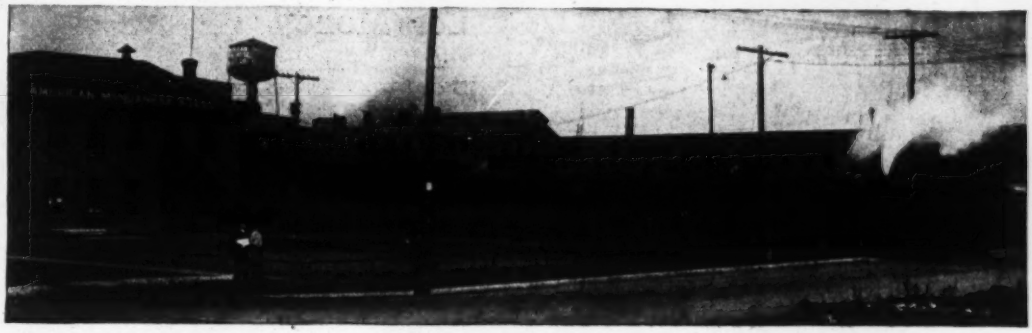
Work Wanted
Etc., Etc., Etc. 35

AMERICAN MANGANESE STEEL COMPANY



The American Manganese Steel Company at its plant "A" located at Chicago Heights, Ill., is using, in general switching service, a 13 in. x 18 in. locomotive built by the American Locomotive Company.

On a 3.4 per cent grade, having a 25 degree curve, this locomotive handles two loaded 30 ton capacity cars. Eight to ten loaded cars are being handled on straight level track.

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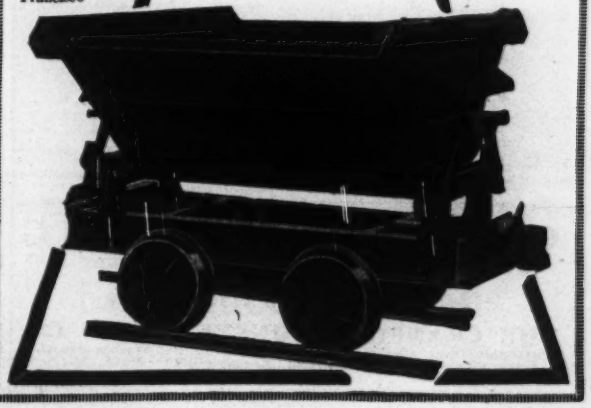

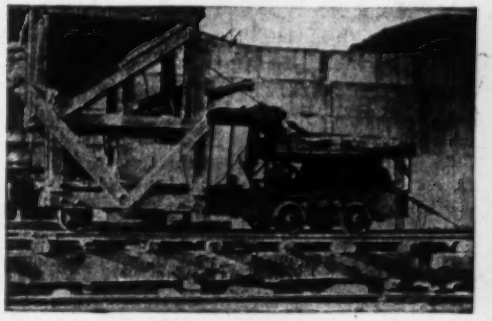

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In special cases the locomotive hauled its load in one minute and ten seconds. Other

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Gasoline Locomotives

owned by contracting and manufacturing firms the country over, are doing all kinds of hauling and cutting former costs away down.

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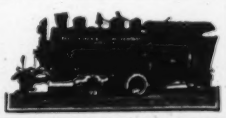

Vulcan Iron Works
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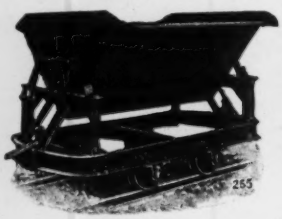

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Haiss "Self-Propelled" Wagon Loader
1c per cu.yd. 1 cu.yd. per min.
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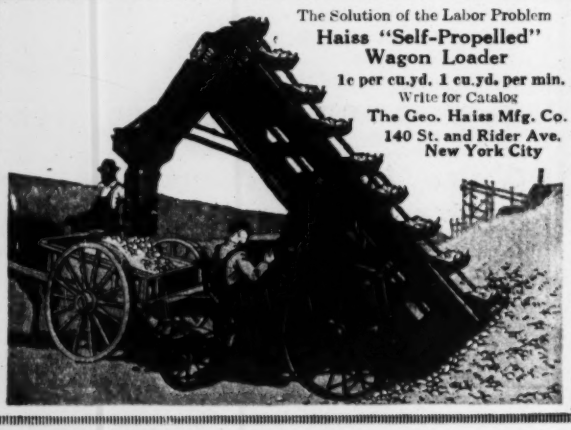

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SIMPLEX CONCRETE PILING METHODS

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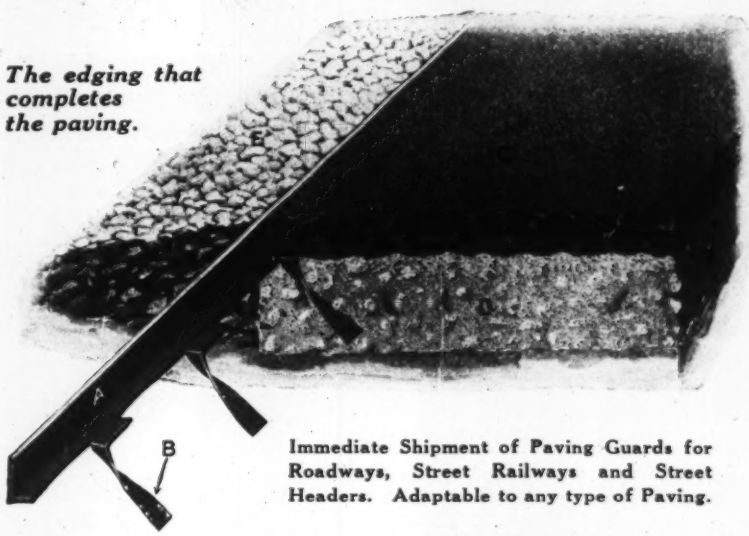

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They prevent the edges of paving from chipping or shaving from the wear and tear of traffic.

They prevent frost under the edges of paving and the consequent disintegration.

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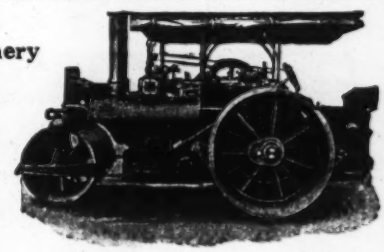

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The Austin Portable Asphalt Mixing Plant

Entirely Self Contained

One unit design
Kettles
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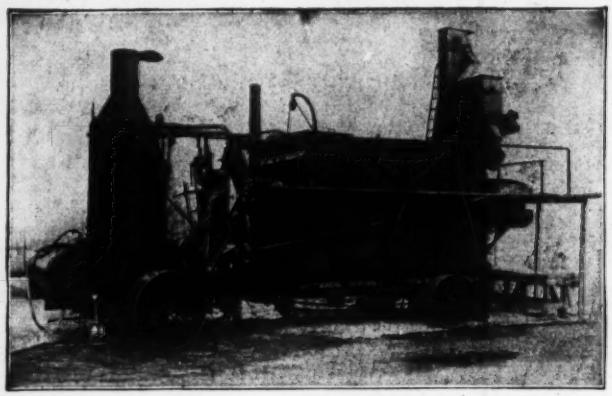

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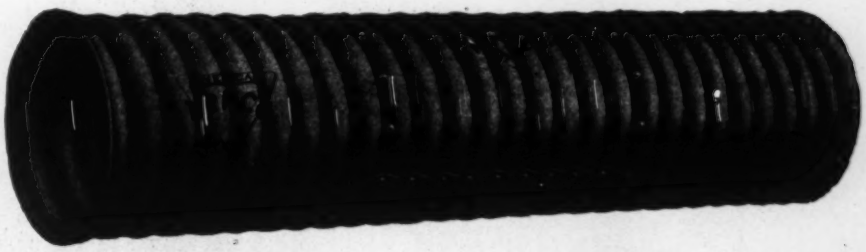
"Armco" Iron Culverts

Realizing the great demand there will be for "Armco" Iron Corrugated Culverts the manufacturers whose names appear at the left have prepared to make prompt shipment of any length, diameter and gauge of culvert specified.



Two men can handle a long length of "Armco" Culvert—an important consideration these days when labor is scarce and high priced. Rugged, rust-resisting "Armco" Iron Culverts are the easiest to install, the most enduring and, in the end, the cheapest and most satisfactory culverts to use.

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"ACME" NESTABLE CORRUGATED CULVERTS

Need no Joining Bands

Read what an official of the Ann Arbor Railway Company has to say about this feature of "ACMES":

"I have been much in favor of 'ACME' (Nestable) corrugated pipe, which I have found to be the easiest connected. It makes very good Culverts, with which we have had no trouble whatever, in breaking apart, which we have had in some other makes."

This gentleman **knows** and you can profit by his experience.

"ACME" Culverts are shipped Set-up complete or in break-jointed sections for making continuous lengths in the field or knocked down and nested, as preferred.

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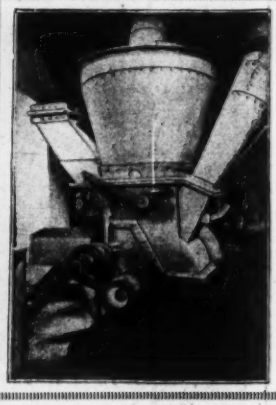

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used in producing a fine ground

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We specialize in the manufacture of pulverizing machinery for the fine grinding of all materials to a powder.

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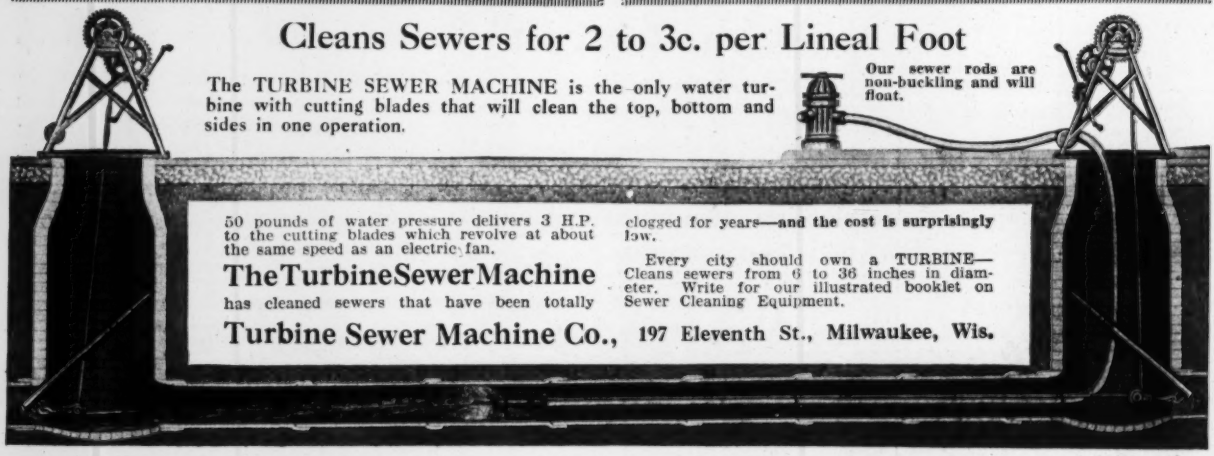

50 pounds of water pressure delivers 3 H.P. to the cutting blades which revolve at about the same speed as an electric fan.

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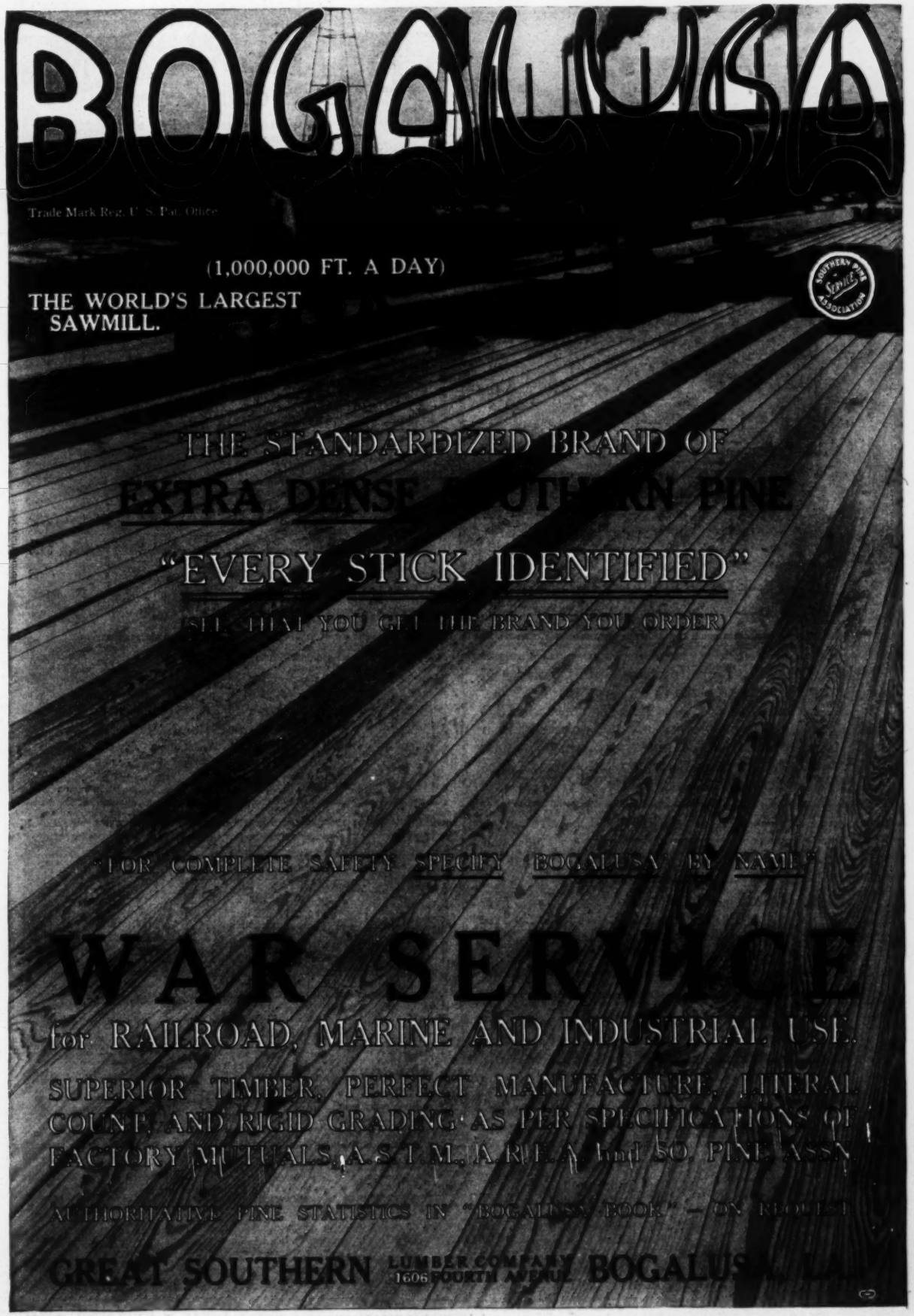
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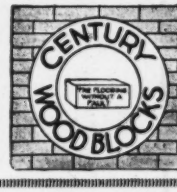

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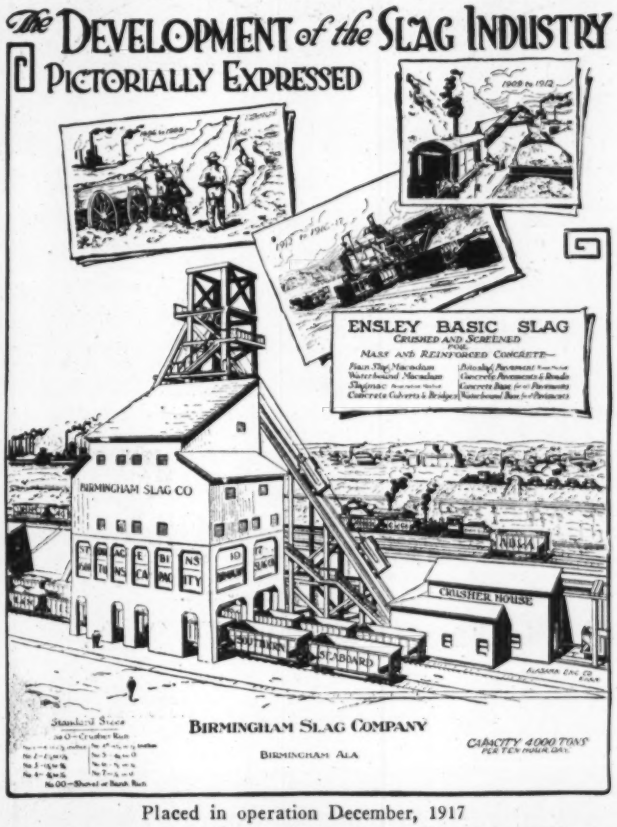

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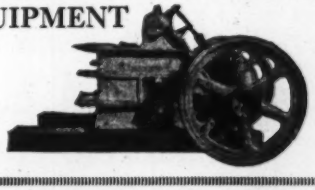

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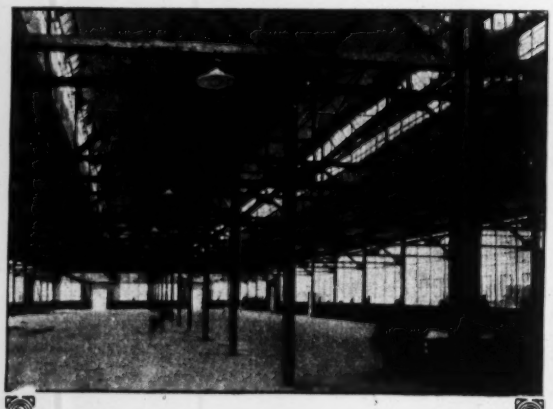

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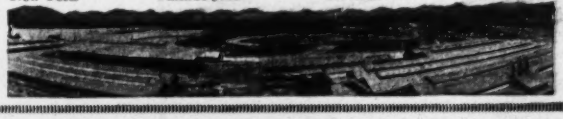

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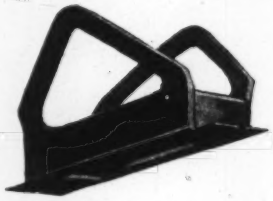
For attaching Shaft Hangers, Fixtures, etc., in Concrete Buildings



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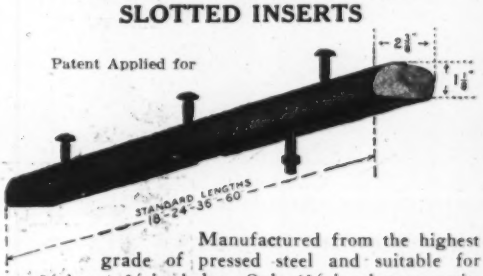
Patent Applied for



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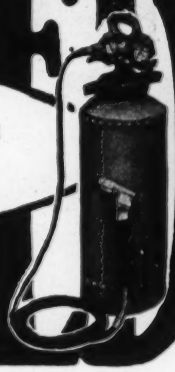

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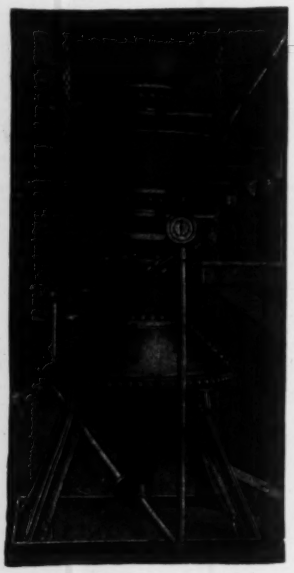

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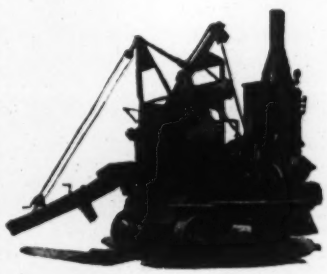

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The data given therein is not only worth sending for, but it is worth keeping when received.

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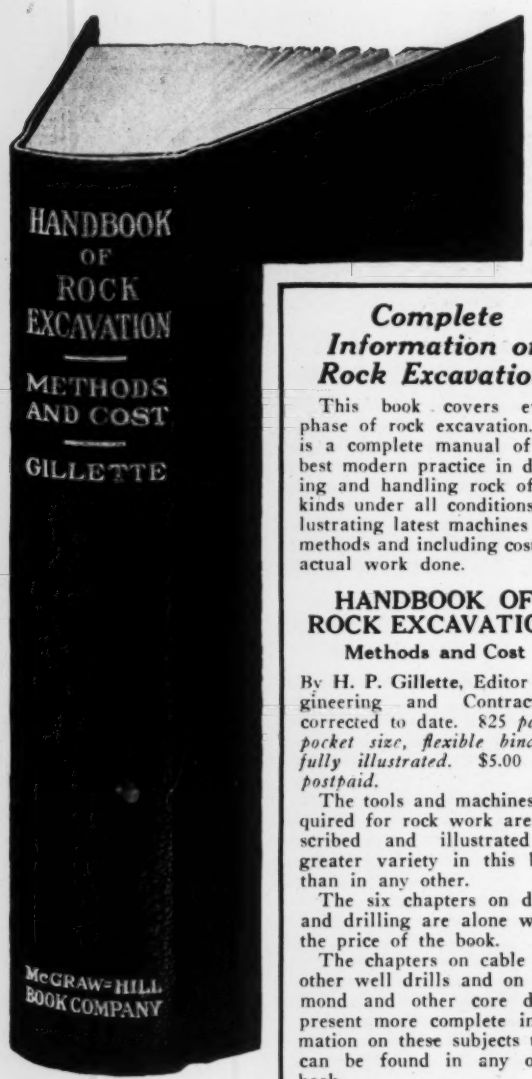

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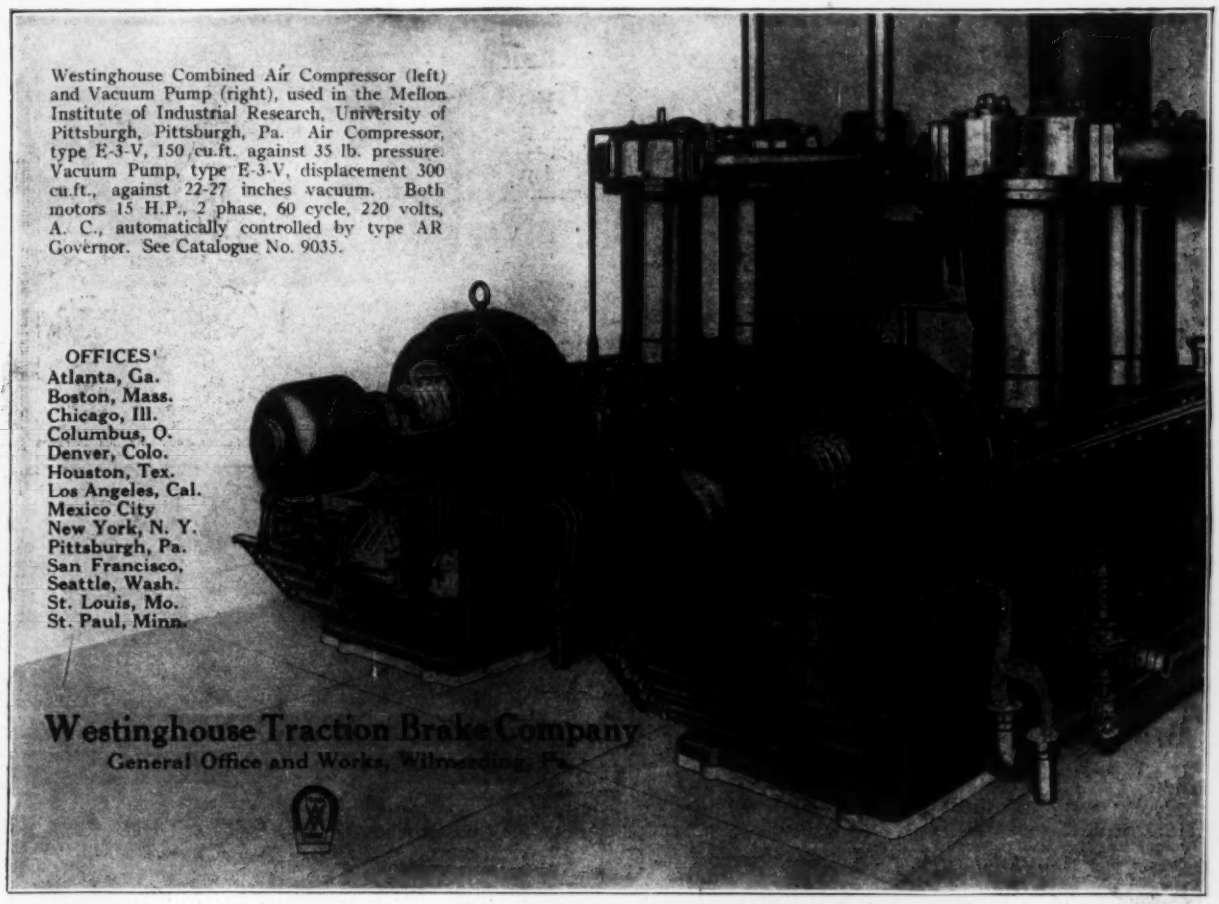

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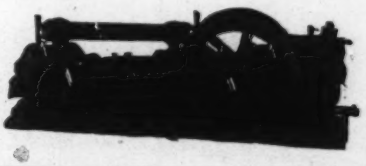

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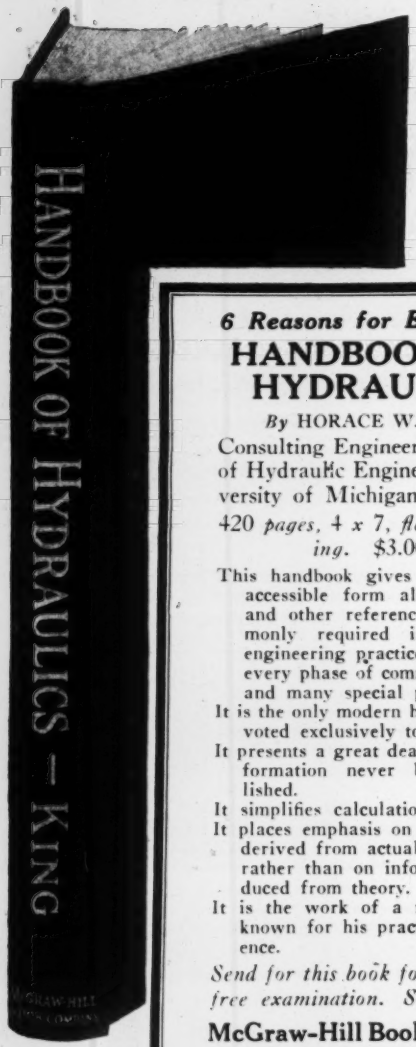

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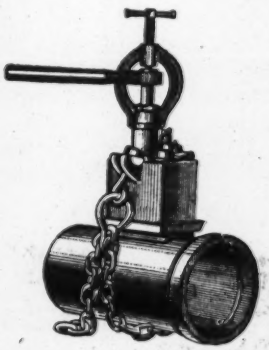

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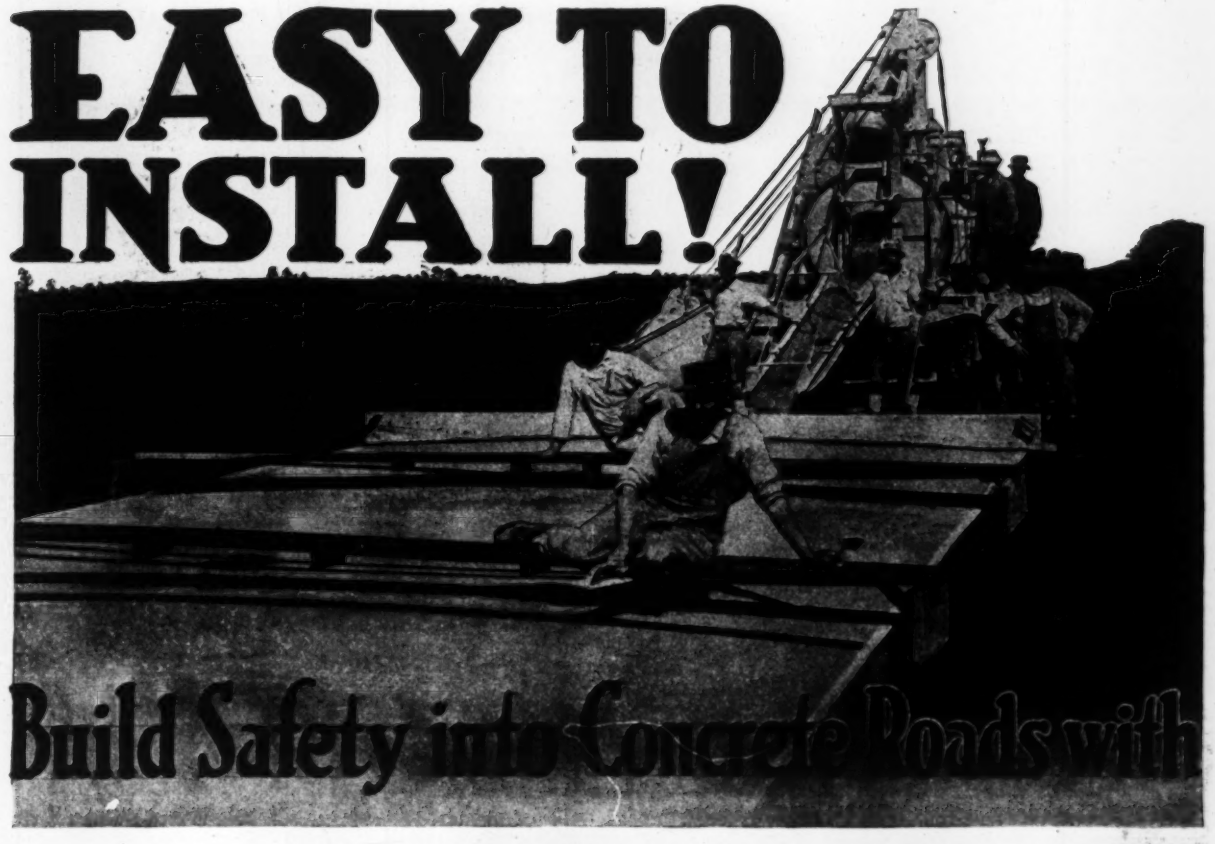

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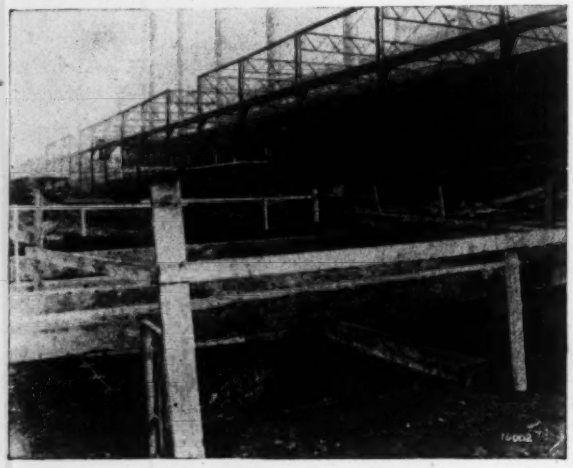

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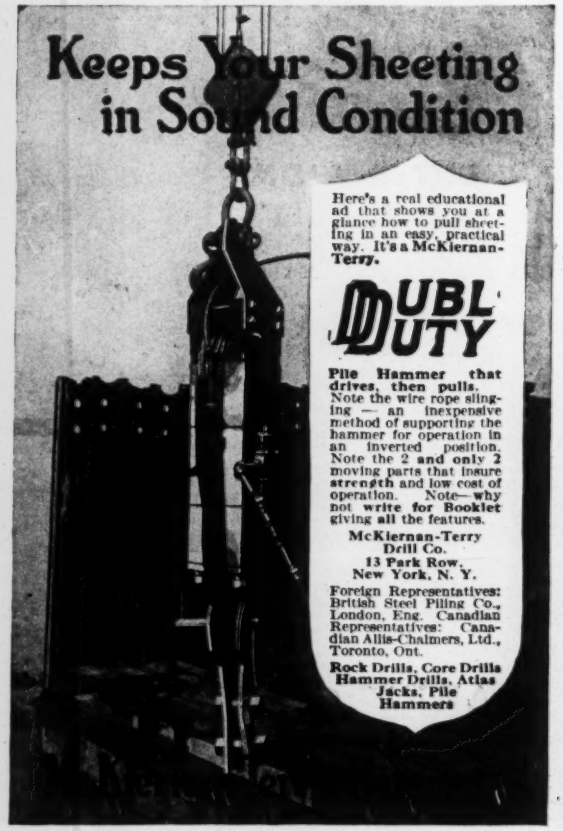

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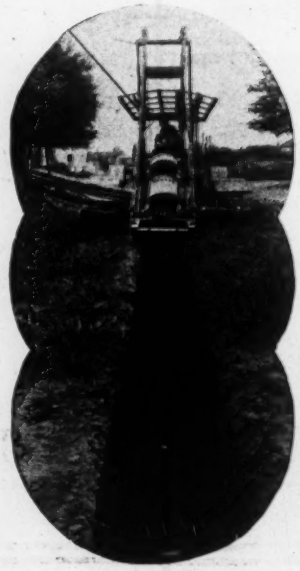

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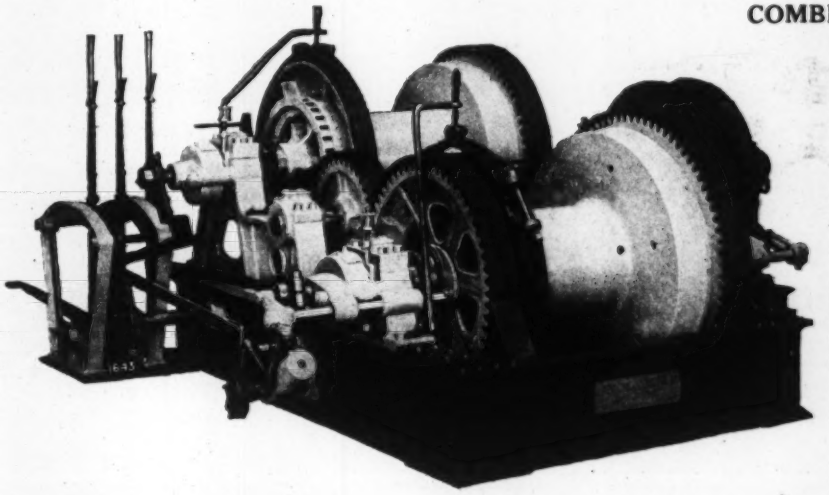

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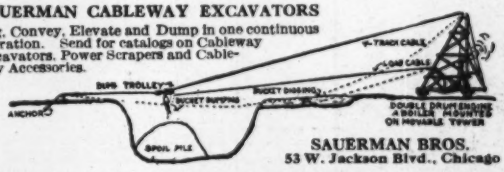

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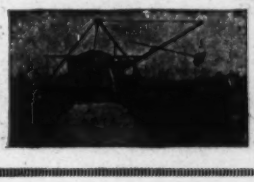

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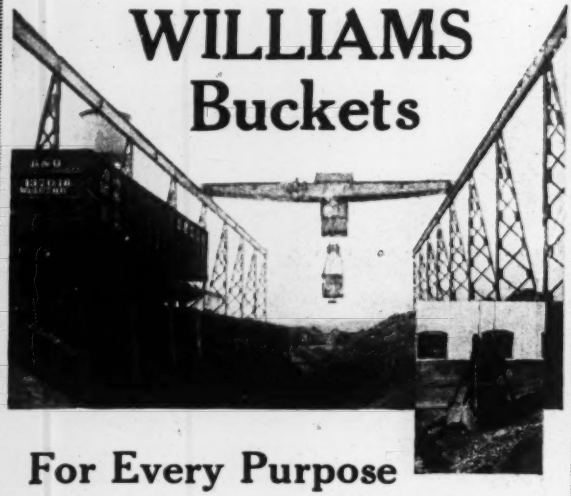

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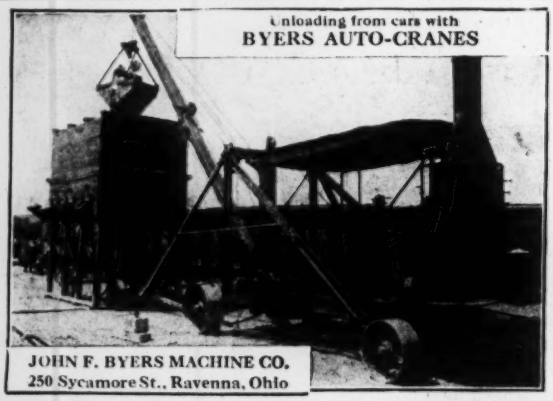

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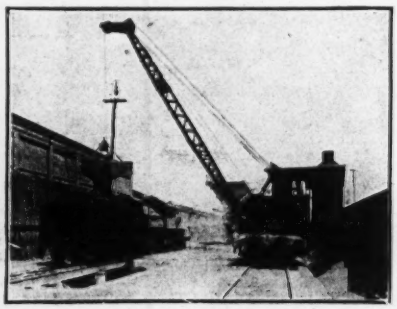

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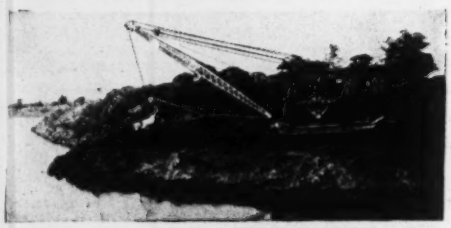

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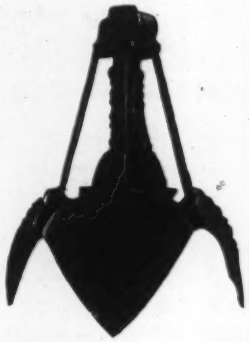

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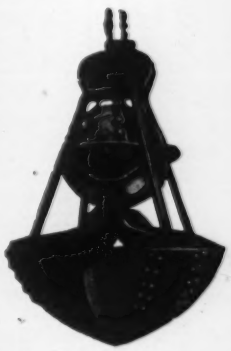

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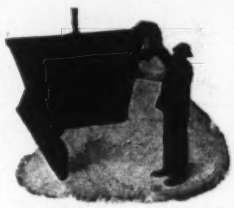

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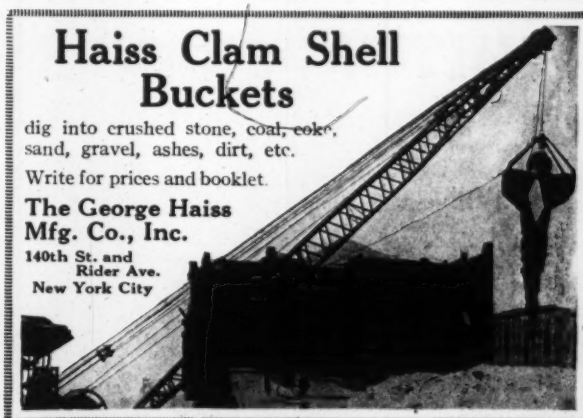

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should be used, because it will give long service regardless of the conditions. Its great strength, combined in just the correct proportion with elasticity and toughness, make it exceedingly durable.

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WATERBURY ROPE

Wire and Fibre

No matter what your requirements or conditions may be, you are almost sure to find they have been anticipated and provided for in the standard sizes and makeups of Waterbury Wire Rope, Armored Rope, Fibreclad Rope and Manila and Sisal Cordage.

And you may rest assured that regardless of what type or grade of rope you may select, its quality will be of the highest, its service of the best and most durable in its class.

Handbooks on Wire Rope or Cordage on Request.

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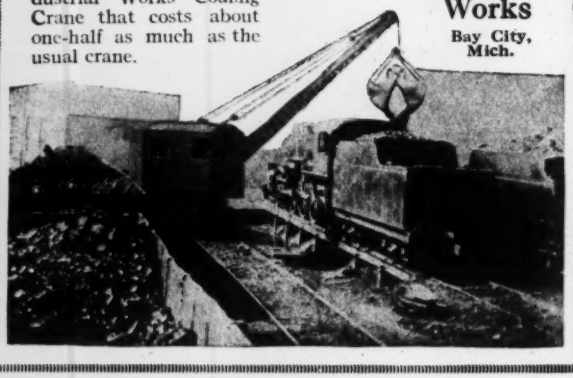
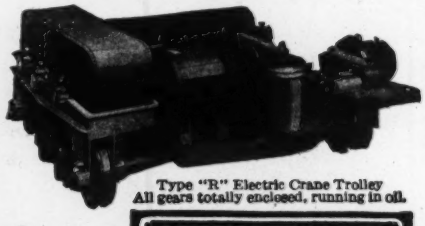
2234-W

A gasoline operated Industrial Works Coaling Crane that costs about one-half as much as the usual crane.

Industrial Works
Bay City, Mich.



WHITING CRANES



Type "R" Electric Crane Trolley
All gears totally enclosed, running in oil.

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Cranes of All Types

STEEL DERRICKS

Prompt shipment on high-grade derricks—any size, type or capacity. Outline your problem fully when writing for data and prices.

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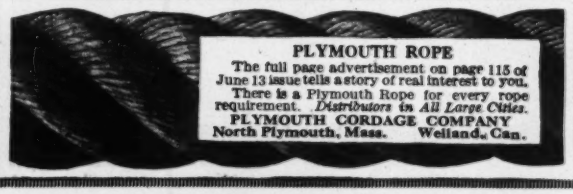
MILWAUKEE, WIS.



PLYMOUTH ROPE
The full page advertisement on page 115 of June 13 issue tells a story of real interest to you. There is a Plymouth Rope for every rope requirement. *Distributors in All Large Cities.*
PLYMOUTH CORDAGE COMPANY
North Plymouth, Mass. Welland, Can.

OHIO LOCOMOTIVE CRANES

OHIO LOCOMOTIVE CRANE CO.
MANSFIELD ST. BUCYRUS, OHIO

ROEBLING WIRE ROPE

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.
Agencies and Branches—New York, Boston, Chicago, Philadelphia, Pittsburgh, Cleveland, Atlanta, San Francisco, Los Angeles, Seattle, Portland, Ore.

TRIDENT

the mark of the water meter that—through worth—has gained pre-eminence

The Trident Family

BACK of each and every Trident type stands the Trident reputation—a reputation won by the service rendered by Tridents in all parts of the world—under all sorts of service conditions—throughout a quarter century.

The Trident has gained **dominance** in the meter world. Its makers are the largest manufacturers of meters on the globe. There are hundreds of thousands more Tridents in service than any other make of meters.

Why? There can be but one answer!

Because Trident **designs** are so correct as to have become standard in meter manufacture. Because Trident **quality** has never stooped to price-competition. Because Trident **manufacturing methods** are so perfect and inspection standards so strict that they are inimitable.

When you purchase a Trident you **know** you are getting the best. And there is a Trident type to efficiently meet every service condition.

A Meter for Every Service Condition

NEPTUNE METER COMPANY

Manufacturers of Trident Water Meters—The Weber Subterranean Pump

50 East 42nd Street, New York City

BRANCHES:

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HIGH FILTER BED EFFICIENCY WITH *SIMPLEX FILTER RATE CONTROLLERS*

Maintains a constant effluent on rapid, slow sand or pressure filters. Can be made to close automatically when clear well is filled and to open again when level falls. Simple and self contained. Easily and quickly adjusted to give any rate of flow desired. Requires no auxiliary valves. In use, extensively, by municipalities, water companies, the leading filter companies and industrial plants.

Simplex Valve & Meter Co., 625 Wood Street, Philadelphia, Pa.

We will be pleased to send Bulletins Nos. 17 and 18 containing full details. Write us.

New England Representative—Geo. W. Stetson, 141 Milk St., Boston, Mass. Pacific Coast Representatives—Water Works Supply Co., San Francisco and Los Angeles.

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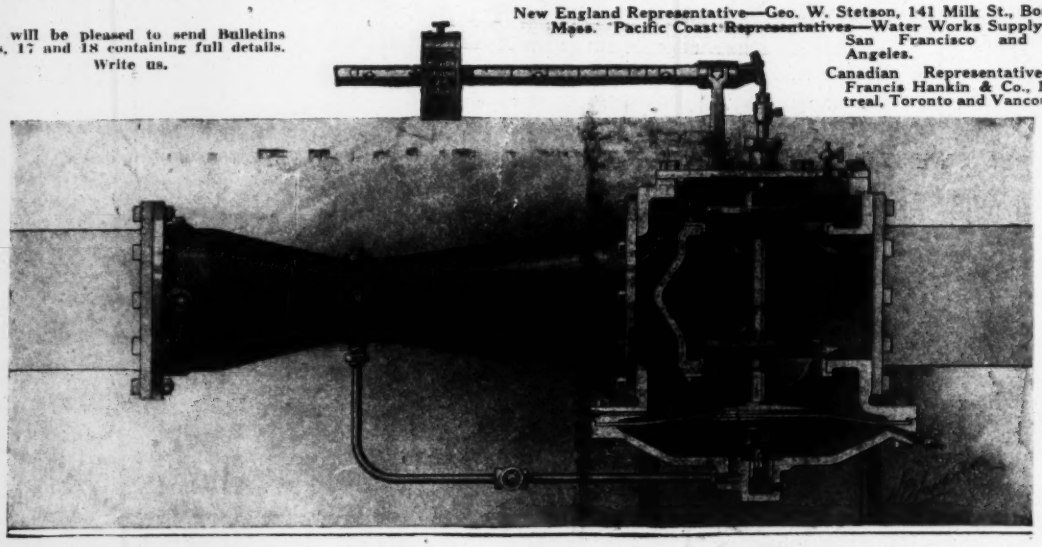

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COLUMBIA, S.C. KANSAS CITY
Water Meters
Pittsburgh Meter Co.
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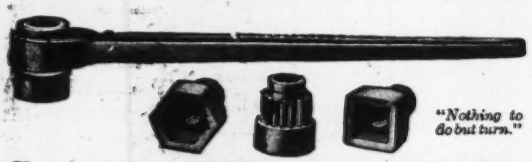

"Nothing to do but turn."

***Your* need for LOWELL Reversible Ratchet Wrenches is urgent**

If you can use the safest, surest and quickest ratchet wrench on the market—A wrench particularly adapted for use on bridge work or other jobs where nuts have to be seated or removed in a cramped space—

Send for Catalog R which give the full story of the Lowell Reversible Ratchet Wrench, TODAY.

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for handling water, gas, oil, steam, etc. For high pressures and low. Prompt shipment from stock.

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81 John Street New York — French Savings Bank Bldg. San Francisco

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Indicate, Register and Record Water, Brine, Oil, Gas, Air, Steam and Other Fluid Flow.
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BOSTON, MASS.
Makers of the Largest Sluice and Gate Valves in America.

Check Valves
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Hydraulically, Electrically and Hand Operated Gate Valves and Sluice Gates
For Waterworks, Power Plants and Filtration Systems
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RESOURCES, $10,310,098.92
Special facilities for out of town accounts

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Use
Liquid Chlorine
To Sterilize Your Water Supply

It is a 100% efficient sterilizing agent

But control it with

"W&T" APPARATUS

The STANDARD Chlorinator

Send for Technical Publication 1 R with full details.

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Pittsburgh filters develop the lowest operating costs consistent with thorough purification.

Each plant is installed after a study of local conditions.

Write us fully what your requirements are, PER HOUR; what the water is to be used for. Give a description of the arrangement of your plant and space, and as complete information as possible as to character of water to be purified.

We will advise you.

PITTSBURGH FILTER MFG. CO.
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Liquid EBD Chlorine

Makes Drinking Water Safe

Our liquified chlorine gas is especially prepared for application to public and private water supplies. Shipped in special Red Cylinders devoted exclusively to water-works service. This insures freedom from foreign matter and other impurities which affect the operation of chlorinators. Write for a copy of the "Wise Cities." It explains.

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Our Recorders Give a Record Chart of Varying Depths for

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Where others fail use Sanborn Recorders. We supply cities, states and corporations and guarantee our outfits subject to the approval of engineers.

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SLUICE GATES, CHECK VALVES, INDICATOR POSTS, ETC.

OUR LINE

GATE VALVES **EDDY** FIRE HYDRANTS

Hydraulically and Electrically-Operated Valves and Sluice Gates
Valves Designed for all Kinds of Service.

EDDY VALVE COMPANY, WATERFORD, N. Y.
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Nicholas Engel

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Cast-Iron Water, Gas and Flange Pipe, Special Castings, Fire Hydrants, Valves, General Foundry and Machine Work.

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Valve Boxes Indicator Posts Air Valves

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All Sizes All Pressures All Purposes

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FOR TOWNS, CITIES AND FACTORIES

One of the Oldest
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IN USE OVER 35 YEARS

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FILTERS

Water Softening Plants
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Over 350 Municipal Filtration Plants
Installed—Total Daily Capacity
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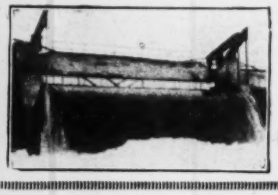
GENERAL OFFICES: NUTLEY, N. J.

Inter-State Building, Kansas City, Mo.; 111 W. Monroe St., Chicago, Ill.; New Birks Building, Montreal.

Originators of Mechanical Filtration



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American patents controlled by the owners, BARRAGES AUTOMATIQUES S.A., ZURICH, SWITZERLAND

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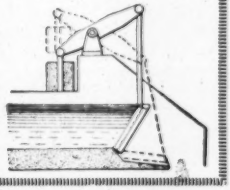
Eastern American Representative

Agents wanted in the Western States.

FOR THE CONTROL OF WATER LEVEL — MANY STYLES



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AMERICAN WATER SOFTENER COMPANY
1009 CHESTNUT ST. PHILADELPHIA, PA.
No affiliation or working agreement with any of our competitors

Hungerford & Terry, Inc.

Water Filters and Softeners

Purification of water for technical and industrial purposes.

1110 Pennsylvania Building, Philadelphia, Pa.

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Shear, Flap and Butterfly Valves

FLEXIBLE JOINTS

COLDWELL-WILCOX CO

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Clean Water Mains
Deliver Full Capacity

We are glad to confer with municipal officials or Water Companies.

National Methods are patented

National Water Main Cleaning Company,

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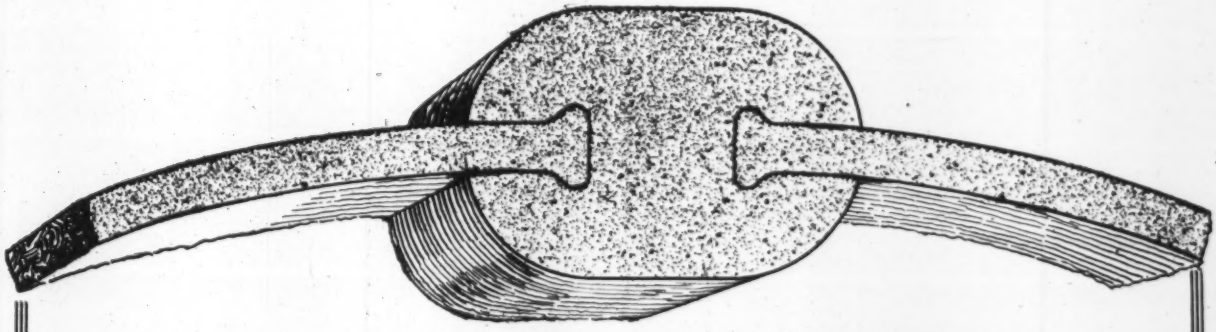
WATER FILTERS for Municipal and Industrial Plants. Gravity and Pressure Types.

CHEMICAL DEVICES



Insure Your Pipe Against Failure

The failure of riveted steel pipe is invariably caused by weakness of the joints. Protect yourself against accidents by using

LOCK-BAR STEEL PIPE

Repeated tests prove conclusively that Lock-Bar 100% Joint is actually stronger than the plate itself, while a double-riveted joint develops only about 70% of the strength of the plate. No wasted metal in Lock-Bar Steel Pipe.

The smooth interior of Lock-Bar Pipe, due to the absence of rivet heads, means lower frictional losses and consequently greater carrying capacity than either riveted steel or cast iron pipe.

The moderate first cost and low maintenance expense coupled with the great durability and long life of Lock-Bar Pipe make it the ideal pipe for water-works installations.

Write today for the Lock-Bar FACTS.

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Fulton and Church Streets, New York City Works: Paterson, N. J.

Caulking Charges Cancelled

Bell-holes practically eliminated.
Trench pumping expense reduced to minimum. Work finished on time.
These are some of the advantages of using

TRADE **"LEADITE"** MARK

Registered U. S. Patent Office

For Jointing C. I. Water Mains

Leadite lessens labor. It fills every crevice from the yarn to face of bell. It is the efficient joint.

Write for booklet. *Specify Leadite.*
"Leadite Joints Increase In Strength With Age."

THE LEADITE COMPANY, Inc.
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THE FIRST CAST IRON PIPE EVER MADE IN THE WORLD'S HISTORY IS STILL IN SERVICE
SERVICE
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MEASURED BY
CAST IRON PIPE
CENTURIES
MORE THAN 250 YEARS OLD

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Half a century's experience, enormous production facilities and three strategic shipping points assure highest quality and on-time delivery.

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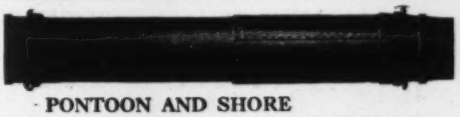
Dredge Pipe



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Elbows, Branches, Ball Joints, Valves, Steel Pontoons
MACHOLD & RIDDELL, Stephen Girard Building PHILADELPHIA, PA.

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Turbines and Water Power Pumps, Sugar House Work, Gas Holders and Gas Machinery, Gas Power Plants with Producers, Mathews' Single and Double Valve Fire Hydrants, Gate Valves, Valve Indicator Posts, Cutting-in Specials.

All Kinds and Sizes of CAST IRON PIPE

Time Saving Means Money Saving

Cut out all the lost motion of nut turning by using the

FAVORITE reversible ratchet **WRENCH**

Built for rough usage

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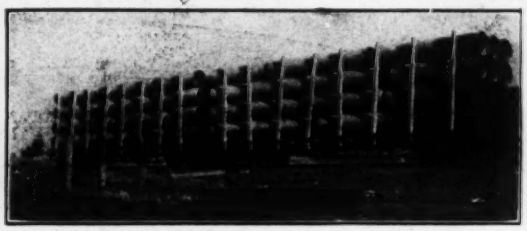
Wire Wound and Continuous Stave Wood Pipe for IRRIGATION and Water Systems. Asbestos and tin-lined Cedar Casings for insulating underground steam pipes.



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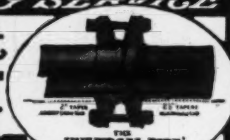
EVERLASTING SERVICE

The permanent PIPE and JOINT



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UNIVERSAL CAST IRON **PIPE**

CAST IRON

STANDARD SIX-FOOT LENGTHS
LAID ANYWHERE WITHOUT CALKING

WRENCHES THE ONLY EQUIPMENT
GASTIGHT — FLEXIBLE — DURABLE

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Marion Shoes for Wood Pipe

are the result of 25 years' endeavor to produce a light-weight, efficient shoe.

This study and experience may be used to your advantage—

Acquaint us with your problem.

The Marion Malleable Iron Works
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"NATIONAL" PIPE

NATIONAL

Look For the Name

serves industry and civilization in numberless ways; therefore, it has been likened to a "NATIONAL" SERVANT.

¶ A full page announcement featuring this idea will appear next week.

¶ Make a point of reading this announcement; it will be illustrated in a unique manner.

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WHY DON'T YOU USE

Wyckoff Wood Pipe

OTHERS DO

Over 1000 miles of Wyckoff Wood Pipe have been installed in the last three years. It can be furnished and laid at half the cost of cast iron.

IT LASTS AS LONG.

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We build machine banded and with individual rods and lugs stave water pipe, from 2" up to 48" for various pressures. Write for our catalogue. It tells you all.

Standard Wood Pipe Co.
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Spiral Riveted Pipe. Large Diameter. Lap Welded Pipe. Forged Steel Pipe Flanges. Flexible Ball Joints. Send for Catalog

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SPIRAL RIVETED PIPE

For conveying water, air, exhaust steam, etc.

Pipe Specialists for 48 Years.

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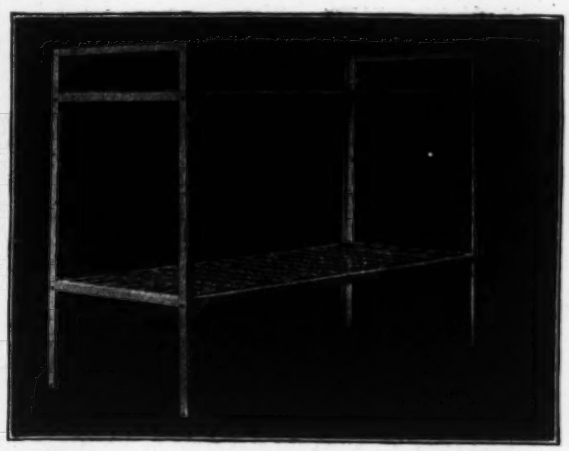
Works: Newburgh, N. Y. New York Office, 45 Broadway

ROOT



Don't Burn Your Bunks

The old-time bunk house with built-in wooden bunks—shows little salvage. It's cheaper and *safer* to burn it. These bonfires cost money—with lumber where it is today.

ROMELINK Bunks

are all steel—safe—sanitary—fireproof. They are *permanent equipment*. They will show you a saving in actual cost and will hold good men to the job. Every man appreciates a good bunk and will *work better* for it.

Write for descriptive matter.

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Efficient Dependable P O W E R

Whatever your power requirements might be, before deciding upon your power unit send for bulletin descriptive of

"Western" Engines

"Western" Engines are economical not only in the amount and quality of fuel used, but also in first cost, maintenance and repair.
Manufactured in sizes from 12 H.P. single cylinder to 320 H.P. twin duplex units, operating on fuel oils of very low gravity.

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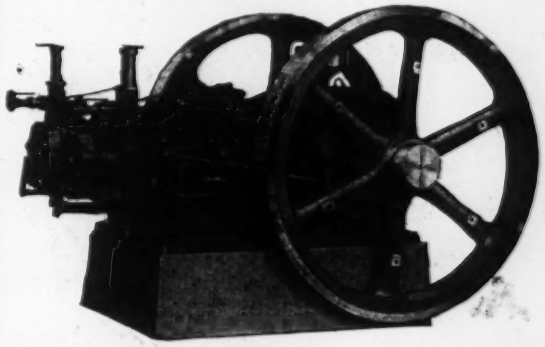

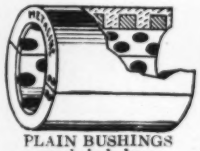

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METALINE

(Trade Mark Reg.)

BUSHINGS for HOISTING SHEAVES

excel all other types for durability under heavy loads, and hard service.

OILLESS
THE METALINE COMPANY
Sole Manufacturers
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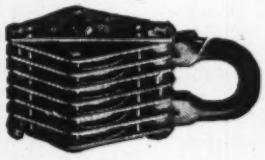

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Are Standard

For any lift or difficult working condition they are safest, strongest and most durable.

Boston & Lockport Block Co.
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ATLANTIC PUMPING ENGINES

are always found on any job where water has to be gotten rid of quickly, steadily, economically.

Telegraph or write for net prices and full description.

Outfits for pumping out Trenches, Excavations, Pier Foundations, Filling Water Carts and Tanks, Road Work—Testing Water Mains

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P.I.W. STEEL PLATE CONSTRUCTION

Riveted Steel Pipe, Smoke Stacks, Stand Pipes, Tankage of any capacity—all classes of steel plate construction.

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Does the Work of Four Laborers

The Junior Trench Pump will lift water containing sand, gravel or sewerage. Can be operated for 7 hours on 1 gallon of gasoline with a capacity of 3,500 gallons per hour. Built for hard service. Any diaphragm pump can be fitted to the outfit.

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Manufacturers of

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SPECIAL CASTINGS

Bell and Spigot—Flanged—Flexible Joint—Culvert—Tubes, Milled and Plain Ends — Cylinders — Manhole Heads and Covers—High-Pressure Fire Service Pipe—All Sizes.

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Vertical and Horizontal Designs

High Speed
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High Efficiency

for

Low, Medium and High Heads

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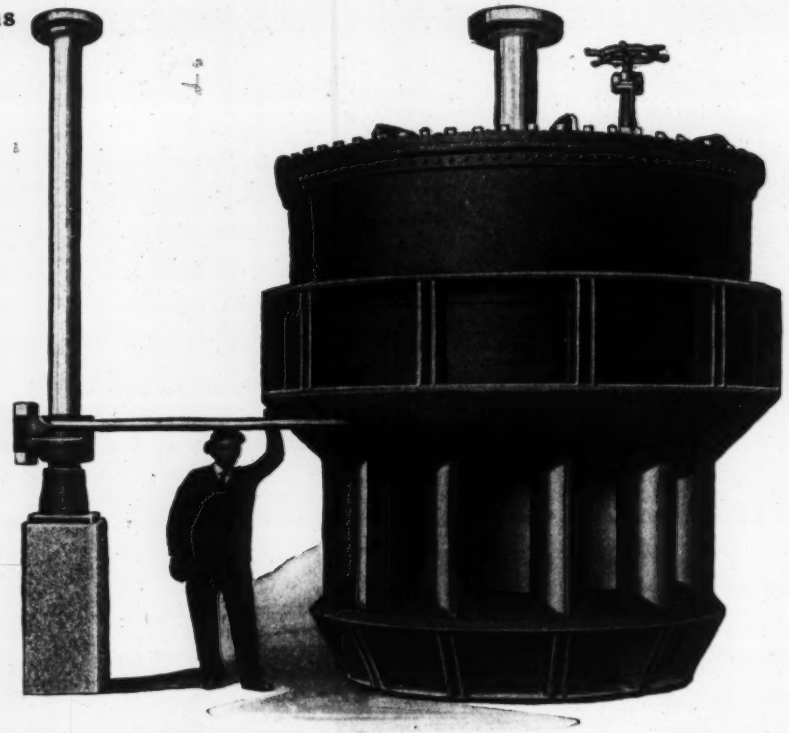

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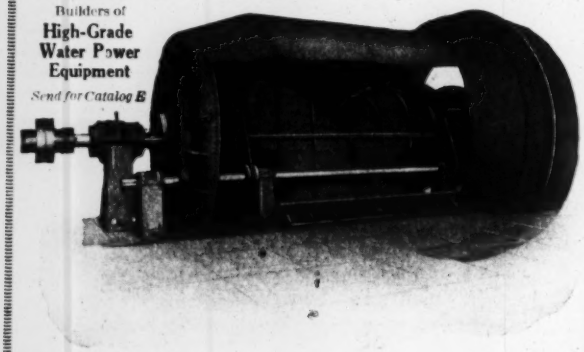

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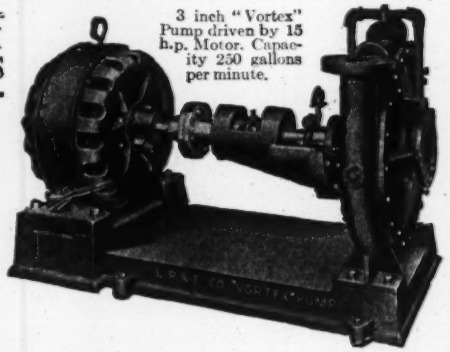

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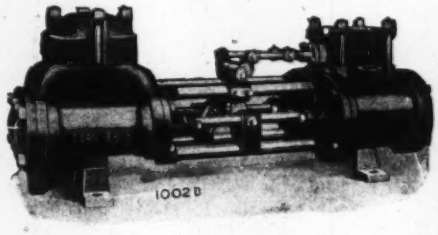

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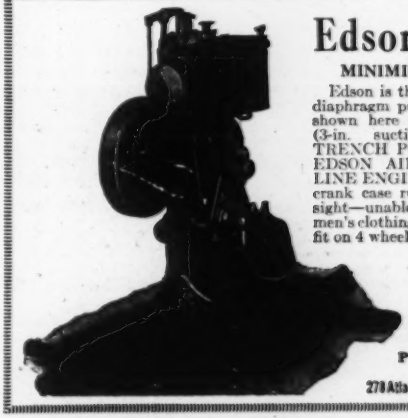

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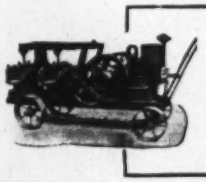

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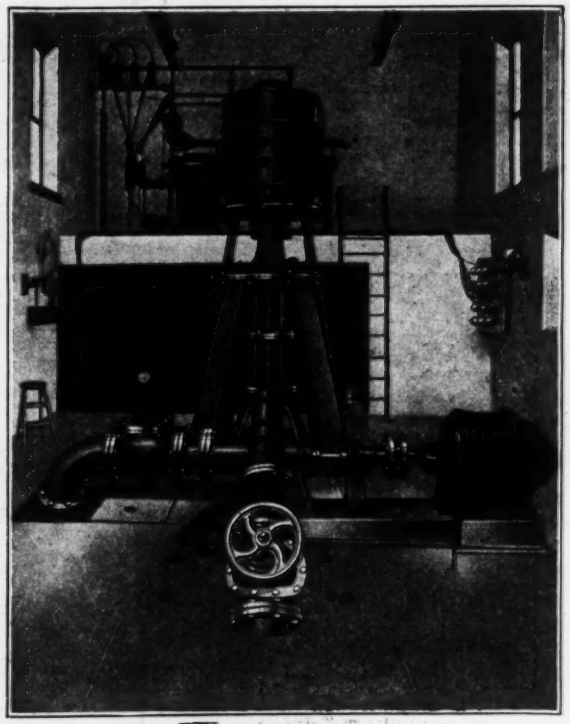

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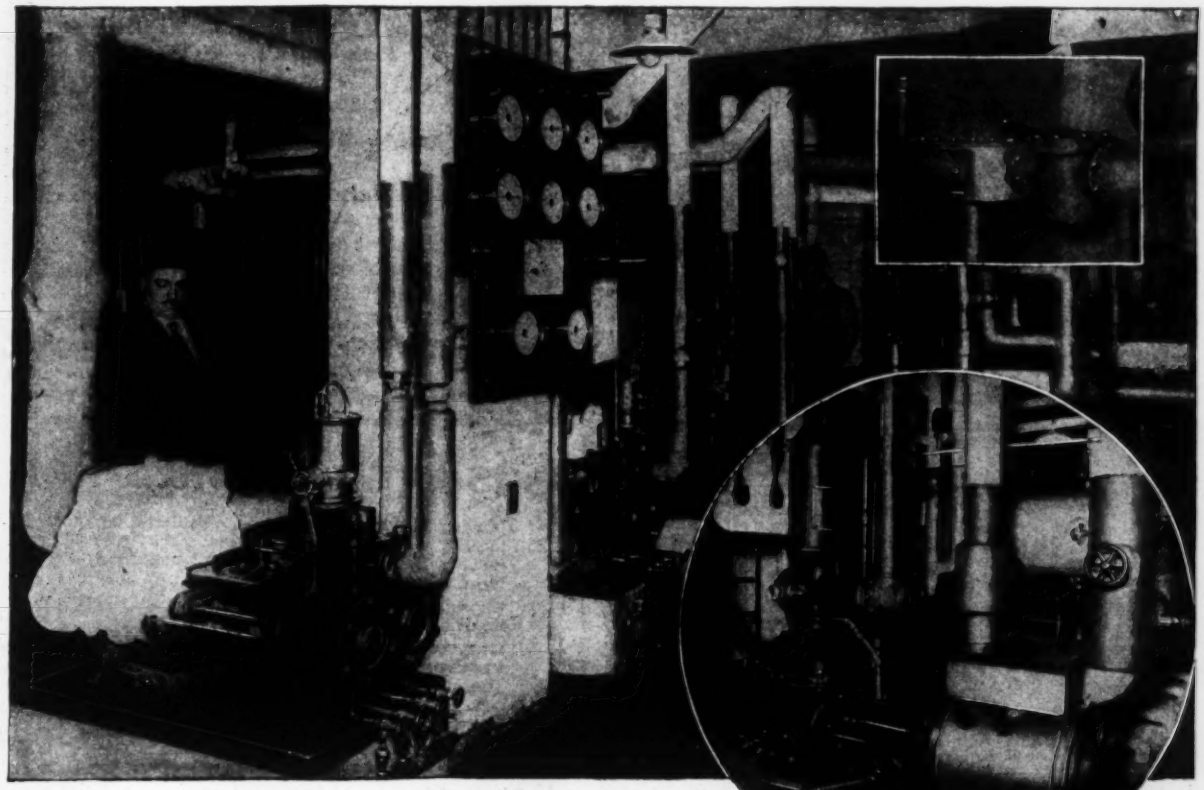

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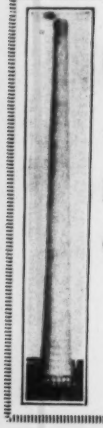

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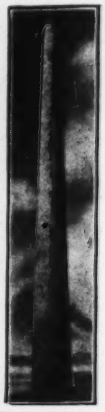

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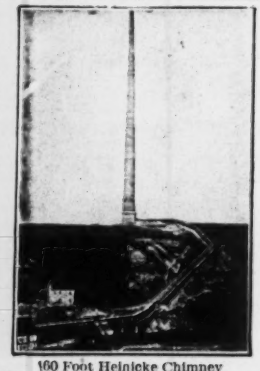

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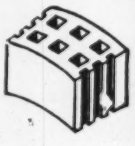

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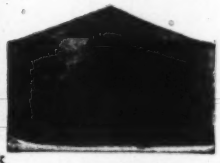

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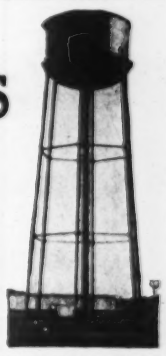

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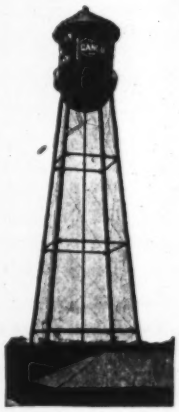

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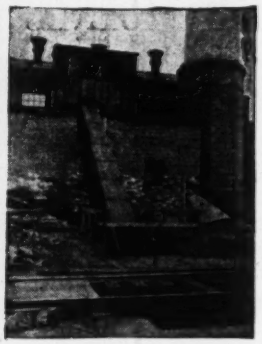

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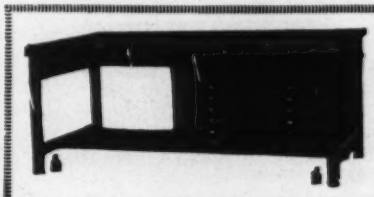

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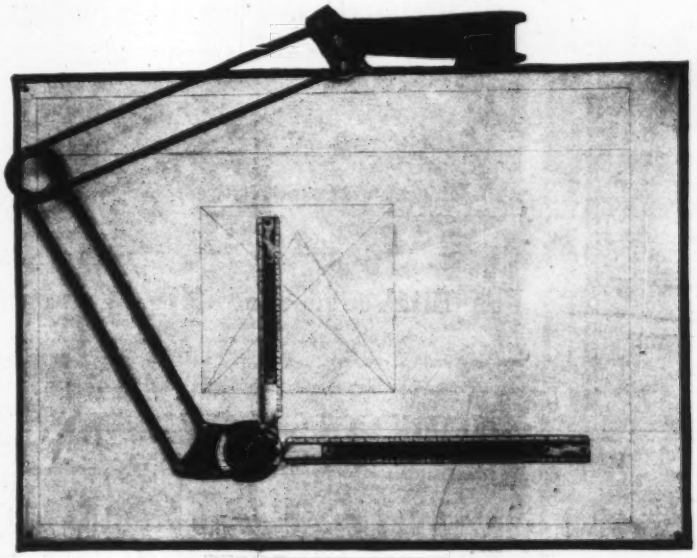

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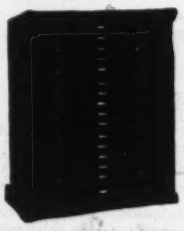

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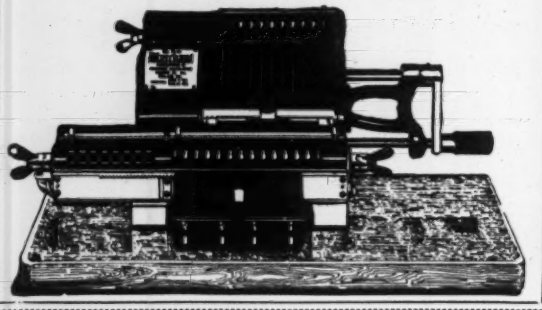

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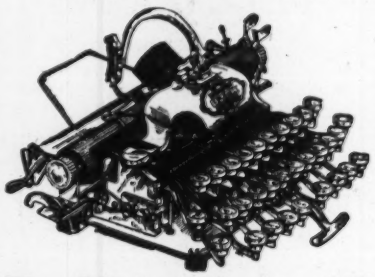

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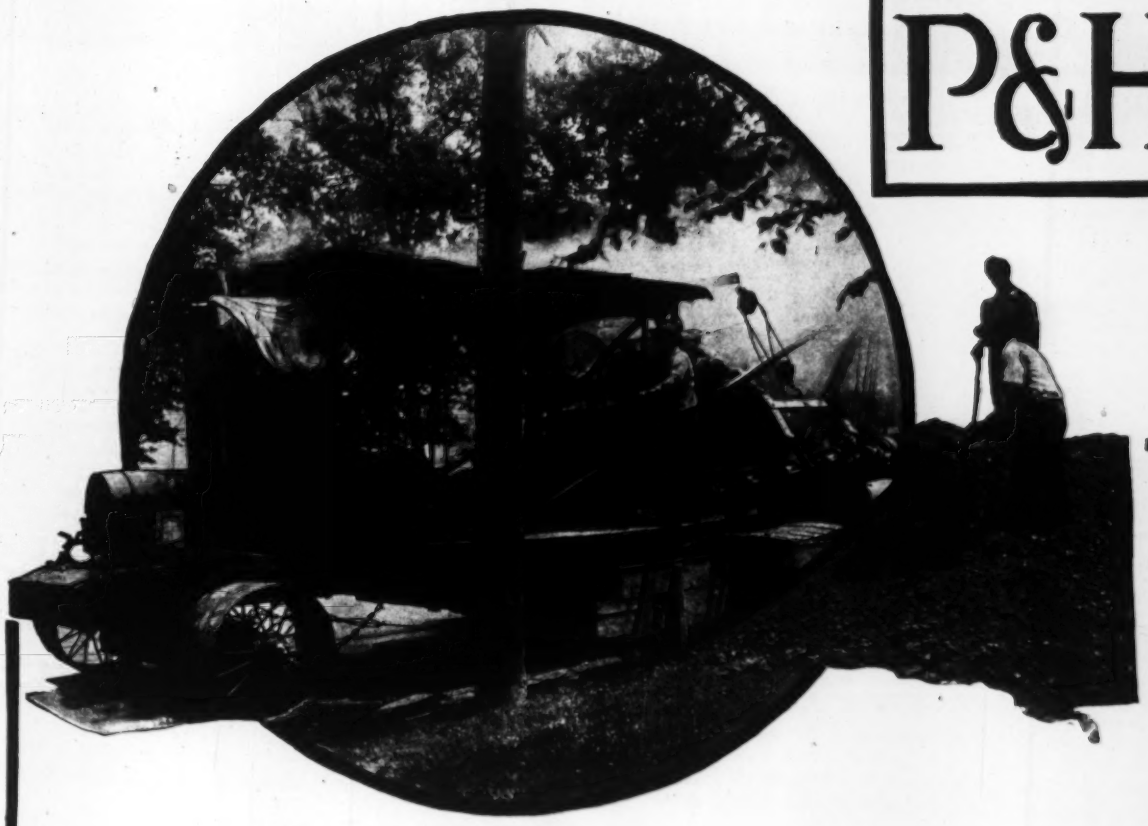

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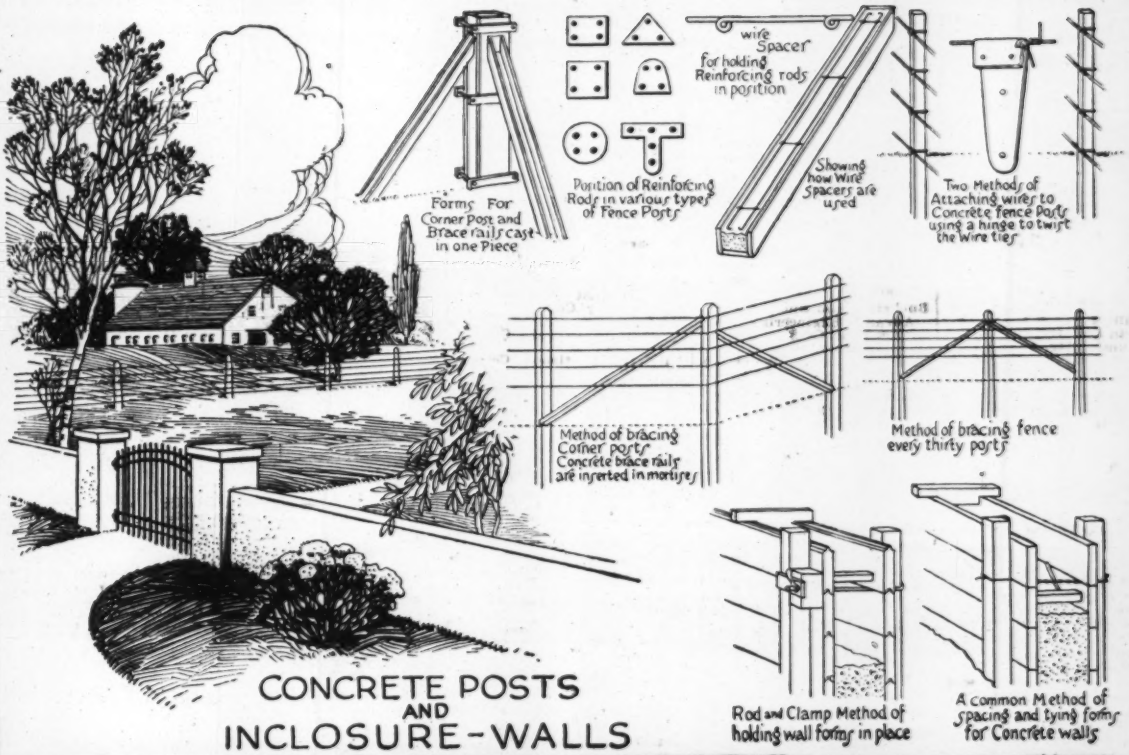
Carbolineum Wood Preserving Co.
Jennison-Wright Co.
Wyckoff Pipe & Creosoting Co.
Crushers and Pulverizers
Allis-Chalmers Mfg. Co.
Austin-Western Rd. Mchy. Co.
Bacon, Earle C.
Jeffrey Mfg. Co., The.
Orton & Steinbrenner Co.
Raymond Bros. Impact Pulverizers Co.
Smidth & Co., F. L.
Smith Co., T. L.
Universal Road Mchry. Co.
Worthington Pump & Machinery Corp.
Culverts
American Sheet and Tin Plate Co.
Canton Culvert & Silo Co.
U. S. Cast Iron Pipe & Fdry. Co.
Culverts, Metal
American Rolling Mills Co.
Armco Iron Culvert Flume Mfrs. Assn.
Baker, W. M.
Bark River & Culvert Co.
Hardesty Mfg. Co.
California Cor. Culvert Co.
Coast Culvert & Flume Co.
Dixie Culvert & Metal Co.
Illinois Cor. Metal Co.
Iowa Pure Cement Co.
Independence Co. Culv. Co.
Kentucky Culvert Mfg. Co.
Lyle Cor. Culvert Co.
Montana Culvert & Flume
Nebraska Culvert & Mfg. Co.
New England Metal Culvert Co.
North East Metal Culvert Co.
North Western Sheet & Iron Co.
Ohio Cor. Culvert Co.
O'Neall Co., W. Q.
Penn Metal Culvert Co.
Road Supply & Metal Co.
Sioux Falls & Metal Culvert Co.
Spokane Culvert & Flume Co.
Tennessee Metal Culvert Co.
Virginia Metal & Culvert Co.
Wyatt Metal & Boiler Wks.
Curb Boxes, Meter
Cast Iron Pipe Publicity Bureau
Curb, Steel Protected
Truscon Steel Co.
Cutting Blowpipes, Oxy-Acetylene
Milburn Co., Alex.
Oxweld Acetylene Co.
Wardwell, F. S.
Derricks and Derrick Fittings
Buffalo Hoist & Derrick Co.
Byers Mach. Co., J. F.
Clyde Iron Works
Dravo Contracting Co.
Hayward Co.
Insley Mfg. Co.
Kern & Hunter
Lidgerwood Mfg. Co.
Terry & Tench Co., Inc.
Disinfecting Apparatus
Electro Bleaching Gas Co.
Wallace & Tiernan Co., Inc.
Distributors, Pressure Oil
(See Road Oilers, Pressure.)
Ditching Machinery
(See Excavators.)
Diving Apparatus
Morse & Son, Inc., A. J.
Docks and Harbor Work
Canal Construction Co., Inc.
Doors and Shutters, Steel Rolling
Detroit Steel Products Co.
Edwards Mfg. Co., The
Lupton's Sons Co., David
Drafting Machines
Universal Drafting Mach. Co.
Drawing Material
American Lead Pencil Co.

Get these Practical ALPHA service sheets on Concrete Construction


Forms For Corner Post and Brace rails cast in one Piece
Portion of Reinforcing Rods in various types of Fence Posts
wire Spacer for holding Reinforcing rods in position
Showing how Wire Spacers are used
Two Methods of Attaching wires to Concrete fence Posts using a hinge to twist the wire ties
Method of bracing Corner posts Concrete brace rails are inserted in mortises
Method of bracing fence every thirty posts
Rod and Clamp Method of holding wall forms in place
A common Method of spacing and tying forms for Concrete walls

CONCRETE POSTS AND INCLOSURE-WALLS

The above illustrations give an idea of the practical suggestions offered by the ALPHA Blueprint Service Sheets and Special Bulletins, which cover the following concrete improvements:

Walkway	Storage Cellar	Tennis Court	Poultry House	Fence Posts
Driveway	Spring House	Concrete Roof	Dipping Vat	Gate Posts
Roads	Small Dam	Silo	Tanks	Walls, Sills
Small Bridges	Milk House	Corn Crib	Piers for Small Boats	Lintels
Culvert	Ice House	Storage House		Garages
Foundation	Manure Pit	Smoke House	Garden Furniture	Porch, Cellar and Stable Floors
Gutter and Curb	Septic Tank	Hog House	Greenhouse	

If you live East of the Mississippi, ask for the Sheet or bulletin that interests you most. A copy of our handbook ALPHA CEMENT—HOW TO USE IT—96 pages illustrated—will also be sent free on request.

ALPHA PORTLAND CEMENT COMPANY, General Offices: Easton, Pa.

BRANCH OFFICES: New York, Boston, Philadelphia, Pittsburgh, Baltimore, Savannah

Concrete for Permanence

WHAT AND WHERE TO BUY

Defiance Mfg. Co.
Dietzgen Co., Eugene
Keuffel & Esser Co.
Kolesch & Co.
Weber & Co., F.

Drawing Tables
(See Tables and Boards, Drawing.)

Dredges
Hayward Co.
Lidgerwood Mfg. Co.

Dredges, Dipper
Bay City Dredge Works
Bucyrus Co.
Flory Mfg. Co., S.
Osgood Co., The
Smith & Sons Co., Theo.
Morris Machine Works

Dredges, Hydraulic
Bucyrus Co.

Drills, Cable
Williams Bros.

Drills, Core
Ingersoll-Rand Co.
Keystone Driller Co.
McKiernan-Terry Drill Co.
Sullivan Machinery Co.

Drills, Hammer
Denver Rock Drill Co.
Ingersoll-Rand Co.
McKiernan-Terry Drill Co.

Drills, Rock
Chicago Pneumtaic Tool Co.
Denver Rock Drill Co.
General Electric Co.
Ingersoll-Rand Co.
Jeffrey Mfg. Co., The
McKiernan-Terry Drill Co.
Schramm and Son, Inc., Chris. D.
Sullivan Machinery Co.

Drill Sharpening Machinery
Denver Rock Drill Mfg. Co.

Drums, Holding
Blaw-Knox Co.
Hayward Co.

Dryers, Clay, Coal, Stone and Sand
Cummers & Sons Co., F. D., The
Fuller Engineering Co.

Edgings Roads
International Steel Tie Co., The

Ejectors, Sewage
Pacific Flush Tank Co.

Electrical Wires and Cables
American Steel & Wire Co.
General Electric Co.

Elevators, Contractors' Materials
Byers Mach. Co., John F.
Hunt Co., Inc., C. W.
Insley Mfg. Co.
Novo Engine Co.
Oshkosh Mfg. Co.
Ohio Locomotive Crane Co.
Ransome Concrete Mchy. Co.

Elevators, Bucket
Chain Belt Co.
Gifford-Wood Co.
Hunt Co., Inc., C. W.
Jeffrey Mfg. Co.
Ohio Locomotive Crane Co.

Elevators, Factory
Ridgway & Son Co., Craige

Engineers and Contractors
Ford, Bacon & Davis Corp.
Raymond Con. Pile Co.
Smith, Hauser & MacIsaac, Inc.
Terry & Tench Co., Inc.
Whitehead & Kales Co.
(See also Directory of Engineers.)

Engineers' and Draftsmen's Instruments and Supplies
Ainsworth & Son, Wm.
Beckmann Co., L.
Berger & Sons, C. L.
Blickensderfer Mfg. Co.
Buff & Buff Mfg. Co.
Defiance Mfg. Co.
Dietzgen Co., Eugene
Gurley, W. & L. E.
Higgins & Co., Chas. M.
Keuffel & Esser Co.
Kolesch & Co.
Marchant Calculating Machine Co.
National Tracing Cloth Co.
Weber & Co., F.
Weiss Instrument Co.
Young & Sons, Inc.

Engines, Gas, Gasoline, Oil
Allis-Chalmers Mfg. Co.
Chicago Pneumatic Tool Co
Schramm and Son, Inc., Chris. D.
Western Machy. Co.
Worthington Pump & Machinery Corp.

Engines, Hoisting
(See Hoists)

Engines, Portable
Leffel & Co., James

Engines, Power Plant
Ball Engine Co.
Erie Steam Shovel Co.

Engines, High Duty Water-Works
Allis-Chalmers Mfg. Co.
Morris Machine Works
Worthington Pump & Mchry. Corp.

Excavators, Cableway
Clyde Iron Works
Lidgerwood Mfg. Co.
Rochester Excavating Machinery Co.

Excavators, Ditch & Trench
Austin Co., Inc., F. C.,
Buckeye Traction Ditcher Co.
Bucyrus Co.
Parsons Co.
Pawling & Harnischfeger Co.
Thew Auto. Shovel Co.

Excavators, Dragline
Austin Co., Inc., F. C.,
Bucyrus Co.
Dravo Contracting Co.
Economy Excavator Co.
Hayward Co.
Osgood Co., The
Pawling & Harnischfeger Co.

Expanded Metal
Consolidated Expanded Metal Cos.
Truscon Steel Co.

Export Agencies
Allied Constr. Mchy. Corp.
Liberty Steel Products Co.

Fences, Wire
Clinton Wire Cloth Co.

Filing Cabinets
Economy Drawing Table Co.

Filters, Water, Municipal & Industrial
American Water Softener Co.
General Filtration Co.
Hungerford & Terry, Inc.
International Filter Co.
N. Y. Con. Jewell Filt. Co.
Norwood Eng'g. Co.
Pittsburgh Filter Mfg. Co
Roberts Filter Mfg. Co.
Simplex Valve & Meter Co

Fire Hydrants
Flower-Stephens Mfg. Co.

Fire Extinguishers
Badger & Sons Co., E. B.

Fireproof Material and Construction
Aspromet Co.
Detroit Steel Products Co.
General Fireproofing Co.
Keasbey & Mattison Co.

Floor Hardener, Concrete
(See Concrete Floor Hardener.)

Floor, Wood Block
Barrett Co.
Jennison-Wright Co.

Flumes, Iron and Steel
American Rolling Mills Co.
Armco Iron Culvert Flume Mfrs. Assn.
Baker, W. M.
Bark River & Culvert Co.
Hardesty Mfg. Co.
California Cor. Culvert Co.
Coast Culvert & Flume Co.
Delaware Metal Culvert Co.
Dixie Culvert & Metal Co.
Illinois Cor. Metal Co.
Iowa Pure Cement Co.
Independence Co. Culv. Co.
Kentucky Culvert Mfg. Co.
Lyle Cor. Culvert Co.
Montana Culvert & Flume
Nebraska Culvert & Mfg. Co.
New England Metal Culvert Co.
North East Metal Culvert Co.
North Western Sheet & Iron Co.
Ohio Cor. Culvert Co.
O'Neall Co., W. Q.
Penn Metal Culvert Co.
Road Supply & Metal Co.
Sioux Falls & Metal Culvert Co.
Spokane Culvert & Flume Co.
Tennessee Metal Culvert Co.
Virginia Metal & Culvert Co.
Wyatt Metal & Boiler Wks.

Forgings, Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Form Clamps
Insley Mfg. Co.
Marion Malleable Iron Works
Universal Clamp Co.

Forms, Culverts, Sewers, Tunnels, etc.
Blaw-Knox Co.
Foote Concrete Mchry. Co.

Forms for Walls, Building Construction, Etc.
Blaw-Knox Co.
Concrete Engineering Co.

Foundations
American Bridge Co.
Concrete Engineering Co.
Cranford Constr. Co.
Raymond Concrete Pile Co.
Smith, Hauser & MacIsaac, Inc.
Underpinning & Foundation Co.

Foundry Equipment
Whiting Fdry. Equip. Co.

Frogs and Switches, Railway
Lakewood Engineering Co.
Ramapo Iron Works

Furnaces, Annealing and Tempering
American Gas Furnace Co.
General Electric Co.

Furnaces, Gas
American Gas Furnace Co.

Garbage-Disposal Apparatus
Jeffrey Mfg. Co., The

Gaskets
Badger & Sons Co., E. B.
Smooth-On Mfg. Co.

Gas Producers
Allis-Chalmers Mfg. Co.
Improved Equipment Co.

Gates, Sluice
Coffin Valve Co.
Coldwell-Wilcox Co.
Fargo Engineering Co.

Gauges, Loss of Head
Simplex Valve & Meter Co.

Gauges, Rate of Flow
Simplex Valve & Meter Co.

Gears, Silent
General Electric Co.

Generators, Electric
Allis-Chalmers Mfg. Co.
General Electric Co.

Glass Construction
Detroit Steel Products Co.
Keppler Glass Constructions, Inc.

Glass, Fireproof
(See Wire Glass)

Governors, Waterwheel
Woodward Governor Co.

Graders, Road
Austin Mfg. Co.
Austin-Western Road Machinery Co.
Kochring Mch. Co.
Western Wheeled Scraper Co.

Granite
Rockport Granite Co.

Graphite
Dixon Crucible Co., Joseph

Grating, Subway
Irving Iron Works

Gravel Washing Plants
Sauerman Bros.

Hammers, Steel Pile
(See Pile Hammers, Steam)

Heaters, Concrete Water
Lakewood Eng'g. Co.

Hoists, Concrete Tower
Lakewood Engineering Co.
Oshkosh Mfg. Co.

Hoists, Contractors' Electric
Buffalo Hoist & Derrick Co.
Clyde Iron Works
Ingersoll-Rand Co.
Lidgerwood Mfg. Co.
Schramm and Son, Inc., Chris. D.
Western Mchy. Co.

Hoists, Concrete Tower
Lakewood Engineering Co.

Hoists, Contractors; Gasoline
Byers Mach. Co., John F.
Lidgerwood Mfg. Co.
Minneapolis Steel & Mchy. Co.
Orr & Sembower Co.
Western Machy. Co.

Hoists, Contractors; Steam
Byers Mach. Co., John F.
Buffalo Hoist & Derrick Co.
Clyde Iron Works
Flory Mfg. Co., S.
Lakewood Engineering Co.
Schramm and Son, Inc., Chris. D.
Lidgerwood Mfg. Co.
Vulcan Iron Works of Wilkes-Barre, Pa.

Hoists, Headgate
Coffin Valve Co.

Hoists, Pneumatic
Ingersoll-Rand Co.
Whiting Fdry. Equip. Co.

Hoppers, Concrete Gravity
Insley Mfg. Co.
Lakewood Eng'g. Co.

Hydrants
Eddy Valve Co.
Flower-Stephens Mfg. Co.
Kennedy Valve Mfg. Co.
Norwood Engineering Co.
Rensselaer Valve Co.
Smith Mfg. Co., A. P.
Wood & Co., R. D

Hydro-Electric Construction
General Electric Co.

Incinerators
Jeffrey Mfg. Co.
Power Specialty Co.

Inks and Adhesives
Higgins Co., C. M.

Inserts, Concrete
Security Insert Co.
Truscon Steel Co.

Inspecting Laboratories
(See Directory of Engineers)

Instruments, Drawing
Keuffel & Esser Co.
Weber & Co., F.

Instruments, Surveying
Ainsworth & Sons, Wm.
Berger & Sons, C. L.
Buff & Buff Mfg. Co.
Gurley, W. & L. E.
Keuffel & Esser Co.
Kolesch & Co.
Weiss Instrument Co.
Young & Sons, Inc.

Iron Work, Structural and Ornamental
Christopher & Simpson Iron Works
Irving Iron Works
Snead Architectural Iron Works

Jacks, Hydraulic
McKiernan-Terry Drill Co.
Norton, Inc., A. O.

Joints, Expansion, Copper
Badger & Sons, E. B.

Joints, Expansion, Paving
Barrett Co.
Carey Co., Philip
Truscon Steel Co.

Joint Filler, Paving
Barrett Co.
Pioneer Asphalt Co.
Standard Oil Co. of N. Y.

Joints, Flexible Pipe
Central Foundry Co.
Coldwell-Wilcox Co.
U. S. Cast Iron Pipe & Foundry Co.

Kettles, Asphalt and Tar
Union Iron Works

Kilns, Lime
Improved Equipment Co.
Petroleum Iron Works Co.

Lamps, Arc and Incandescent
General Electric Co.

Lamps, Flood
General Electric Co.

Lath Expanded Metal
American Rolling Mills Co.
Armco Iron Culvert Flume Mfrs. Assn.
Baker, W. M.
Bark River & Culvert Co.
Hardesty Mfg. Co.
California Cor. Culvert Co.
Coast Culvert & Flume Co.
Delaware Metal Culvert Co.
Dixie Culvert & Metal Co.
Illinois Cor. Metal Co.
Iowa Pure Cement Co.
Independence Co. Culv. Co.
Kentucky Culvert Mfg. Co.
Lyle Cor. Culvert Co.
Montana Culvert & Flume
Nebraska Culvert & Mfg. Co.
New England Metal Culvert Co.
North East Metal Culvert Co.
North Western Sheet & Iron Co.
Ohio Cor. Culvert Co.
O'Neall Co., W. Q.
Penn Metal Culvert Co.
Road Supply & Metal Co.
Sioux Falls & Metal Culvert Co.
Spokane Culvert & Flume Co.
Tennessee Metal Culvert Co.
Virginia Metal & Culvert Co.
Wyatt Metal & Boiler Wks.

Lead Pencils
American Lead Pencil Co.
Dixon Crucible Co., Jos.

Leadite
Leadite Co., Inc., The

Lights, Contractors'
Carbic Mfg. Co.
General Electric Co.
Milburn Co., Alex.

Lights, Roof, Vault, Sidewalk
Keppler Glass Constructions, Inc.

Loaders, Wagon
(See Wagon Loaders.)

Lockers, Steel
Edwards Mfg. Co., The
Lupton's Sons Co., David

Locomotives, Compressed Air
Porter & Co., H. K.
Vulcan Iron Works of Wilkes-Barre, Pa.

Locomotives, Electric
American Locomotive Co.
General Electric Co.
Jeffrey Mfg. Co., The
Lakewood Eng'g. Co.

Locomotives, Fireless Steam
Porter Co., H. K.

Locomotives, Gasoline
Bell Locomotive Wks., Inc.
Fate Co., J. D.
Vulcan Iron Works of Wilkes-Barre, Pa.

Locomotives, Steam
American Locomotive Co.
Bell Locomotive Works
Porter Co., H. K.
Vulcan Iron Works of Wilkes-Barre, Pa.

Lubricants
Dixon Crucible Co., Joseph
Greene, Tweed & Co
Texas Co.

Lumber
Bowers Co., S. P.
Great Southern Lumber Co.
Pearson & Ludascher Lumber Co., Inc.

Manhole Covers
Central Foundry Co.
Sessions Foundry Co.

Manometers
Simplex Valve & Meter Co

Metals, Perforated
Chicago Perforating Co.

Meters, Boiler Feed Water
Builders Iron Foundry Co.

Meter Boxes
Cast Iron Pipe Publicity Bureau
Pittsburgh Meter Co.

Meters, Current
General Electric Co.
Gurley, W. & L. E.

Meters, Gas and Steam
Builders Iron Foundry Co.
General Electric Co.

Meter Provers
Pittsburgh Meter Co.

Meters, Water and Oil
Neptune Meter Co.
Pittsburgh Meter Co.
Simplex Valve & Meter Co.
Worthington Pump & Machinery Corp.

Mixers, Asphalt
(See Mixers, Hot)

Mixers, Concrete
Austin Co., Inc., F. C.
Blaw-Knox Co.
Cement-Gun Co.
Chain Belt Co.
Eureka Machine Co.
Foote Concrete Mchry. Co.
Lakewood Engrg. Co.
Oshkosh Mfg. Co.
Pneumatic Concrete Mch. Co.
Ransome Concrete Mchy Co.
Schramm and Son, Inc., Chris. D.
Worthington Pump & Machinery Corp.

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Mixers, Grout
Lakewood Eng'g. Co.
Oshkosh Mfg. Co.

Mixers, Hot
Austin Co., Inc., F. C
Koehring Machine Co.
Lakewood Eng'g. Co.

Mixers, Mortar
Austin Co., Inc., F. C.
Eureka Machine Co.
Koehring Mch. Co.
Lakewood Engineering Co.
Northwestern Steel & Iron Works
Oshkosh Mfg. Co.
Ransome Concrete Mchy. Co.

Mixers, Paving
Austin Co., Inc., F. C.
Chain Belt Co.
Lakewood Eng'g. Co

Mixers, Pneumatic
Ransome Concrete Mchy. Co.

Motors, Electric
General Electric Co.
Westinghouse Traction Brake Co.

Motor Trucks
(See Trucks, Motor.)

Oil Lubricating
Texas Co.

Packing, Water-Pipe
Greene, Tweed & Co.

Paints, Metal Protective
Barrett Co.
Carey Co., Philip
Dixon Crucible Co., Joseph
Minwax Co., Inc.
Scott Structural Iron & Roof Paint Co.
Standard Paint Co.
Toch Bros.
Trus Con. Laboratories

Partitions
Aspromet Co.
Detroit Street Products Co.
Lupton's Sons Co., David

Paving Blocks, Granite
Leopold Co., J. E.
Rockport Granite Co.

Paving Blocks, Creosoted Wood
Jennison-Wright Co.
Republic Creosoting Co.
Wyckoff Pipe & Creosoting Co.

Paving, Guards
International Steel Tie Co., The

Pile Drivers
Bucyrus Co.
Dravo Contracting Co.
McKiernan-Terry Drill Co.

Pile Hammers, Steam
McKiernan-Terry Drill Co.
National Hoisting Engine Co.
Union Iron Works
Vulcan Iron Works, Chicago.

Pile, Shoes
Janney-Steinmetz Co.
Vulcan Iron Works, Chicago

Piles, Concrete
Cranford Constr. Co.
Raymond Con. Pile Co.
Smith, Hauser & MacIsaac, Inc.
Underpinning & Foundation Co.

Piles, Creosoted Wood
Bowers Co., S. P.
Jennison-Wright Co.

Piling, Interlocking Steel
Carnegie Steel Co.

Pipe Bends
East Jersey Pipe Corp.

Pipe, Cast-Iron
American Cast Iron Pipe Co.
Cast Iron Pipe Publicity Bureau
Fox Co., John
Lynchburg Foundry Co.
U. S. Cast Iron Pipe & Foundry Co.
Warren Fdry. & Mach. Co.
Van Nouhuys Mach. Wks.

Pipe Covering, Asbestos
Carey Co., Philip
Wyckoff & Sons Co., A.

Pipe Covering, Wood
Michigan Pipe Co

Pipe, Dredge
Machold & Riddell

Pipe Fittings
Builders Iron Foundry Co.
Cast Iron Pipe Pub. Bureau
Central Foundry Co.
U. S. Cast Iron Pipe and Foundry Co.
Westinghouse Traction Brake Co.
Wood & Co., R. D.

Pipe Joint Compounds (Pressure)
Leadite Co., Inc., The

Pipe, Lap Welded
American Spiral Pipe Wks

Pipe, Lock Bar
East Jersey Pipe Corp.

Pipe Lugs
Marion Malleable Iron Works

Pipe, Riveted Steel
American Spiral Pipe Wks.
Blaw-Knox Co.
East Jersey Pipe Corp.
Machold & Riddell
National Tube Co.
Petroleum Iron Works Co.
Riter-Conley Co.
Tippett & Wood
Walsh's Holyoke Steam Boiler Wks.

Pipe, Spiral Riveted
Abendroth & Root Mfg. Co.
Amer. Spiral Pipe Works.
Standard Spiral Pipe Co.

Pipe, Wood
American Wood Pipe Co.
Continental Pipe Mfg. Co.
Michigan Pipe Co.
Standard Wood Pipe Co.
Wyckoff & Sons Co., A.

Poles, Cross Arms, Etc.
Jennison-Wright Co.

Poles, Steel Structural
Blaw-Knox Co.

Poles, Tubular Steel
Franklin Steel Wks.
National Tube Co.

Pressed Steel Products
Hydraulic Pressed Steel Co.

Pulverizers
Raymond Bros. Impact Pulv. Co.

Pumps, Air Lift
Cameron Steam Pump Works, A. S.
Ingersoll-Rand Co.

Pumps, Boiler Feed, Steam
Cameron Steam Pump Works, A. S.
Dean Bros. Steam Pump Works
Worthington Pump & Machinery Corp.

Pumps, Centrifugal and Multi-Stage High Lift
Allis-Chalmers Mfg. Co.
American Well Works, The
Cameron Steam Pump Works, A. S.
Darling Pump & Mfg. Co.
De Laval Steam Turbine Co.
Earle Gear & Machine Co.
General Electric Co.
Lawrence Pump & Engine Co.
Layne & Bowler Co.
Morris Machine Works
Schramm and Son, Inc., Chris. D.
Taber Pump Co.
Worthington Pump & Machinery Corp.

Pumps, Contractors'
American Well Wks., The
Bond Co., Harold L.
Cameron Steam Pump Wks. A. S.
Deming Co., The
Earle Gear & Mach. Co.
Edson Mfg. Co.
McGowan Co., John H.
Nye Steam Pump & Machinery Co.
Parker, A. A.
Schramm and Son, Inc., Chris. D.

Pumps, Contractors', Vacuum
Nye Steam Pump & Machinery Co.

Pump Controllers
Pneumercator Co.

Pumps, Deep Well
American Well Works, The
Cameron Steam Pump Works, A. S.
Cook, A. D.
Deming Co., The.
Earle Gear & Machine Co.
Keystone Driller Co.
Layne & Bowler Co.
Luitwieler Pumping Engine Co.
Worthington Pump & Machinery Corp.

Pumps, Diaphragm
Bond Co., Harold L.
Boston & Lockport Blk. Co.
Deming Co., The.
Edson Mfg. Co.
Oshkosh Mfg. Co.
Schramm and Son, Inc., Chris. D.
Van Nouhuys Mach. Wks

Pumps, Dredging and Sand
Lawrence Pump & Engine Co.
Morris Machine Works
Nye Steam Pump & Machinery Co.
Parker, A. A.
Worthington Pump & Mchy. Corp.

Pumps, Elevator
Worthington Pump & Machinery Corp.

Pumps, Power
Cameron Steam Pump Works, A. S.
Cook, A. D.
Dean Bros. Steam Pump Works
Deming Co., The
Layne & Bowler Co.
Luitwieler Pumping Engine Co.
McGowan Co., John H.

Purifiers, Feed Water
N. Y. Continental Jewell Filtration Co.
Norwood Engrg. Co.

Rail and Rail Joints, Fastening Specialties
Bethlehem Steel Co.
Carnegie Steel Co.

Railroad Ditchers
Ball Engine Co.
Erie Steam Shovel Co.

Railways, Industrial
Lakewood Engineering Co.

Recorders, Water Stage
Gurley, W. & L. E.
Sanborn Co.

Reinforcing Concrete
(See Concrete Reinforcement)

Reservoirs, Aerating
Spray Engrg. Co.

River and Harbor Work
Raymond Concr. Pile Co.

Road Oilers, Pressure
Austin-Western Road Mchy. Co.
Universal Road Mchy. Co.

Road Oils and Preservatives
Barrett Co.
Standard Oil Co. of N. Y.

Road Rollers, Gasoline and Steam
Austin-Western Road Machinery Co.
Buffalo-Springfield Roller Co.
Erie Machine Shops

Rolls, Crushing
Jeffrey Mfg. Co.

Roofing, Metal
American Sheet & Tin Plate Co.
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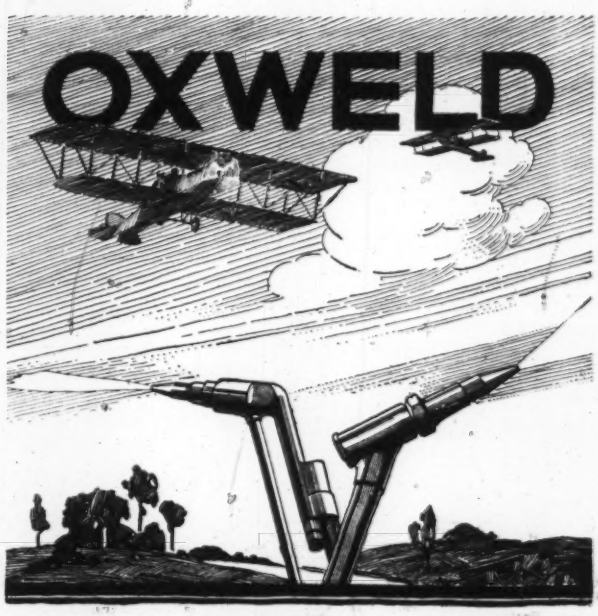

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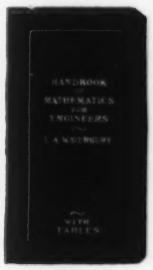

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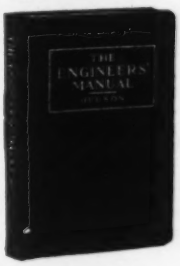

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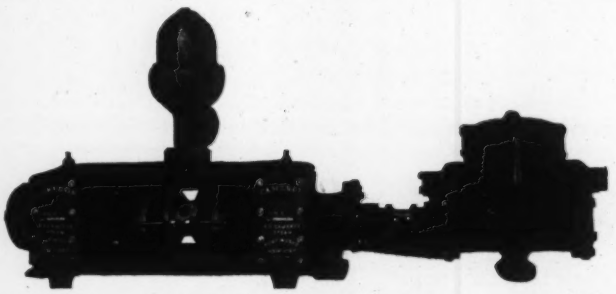

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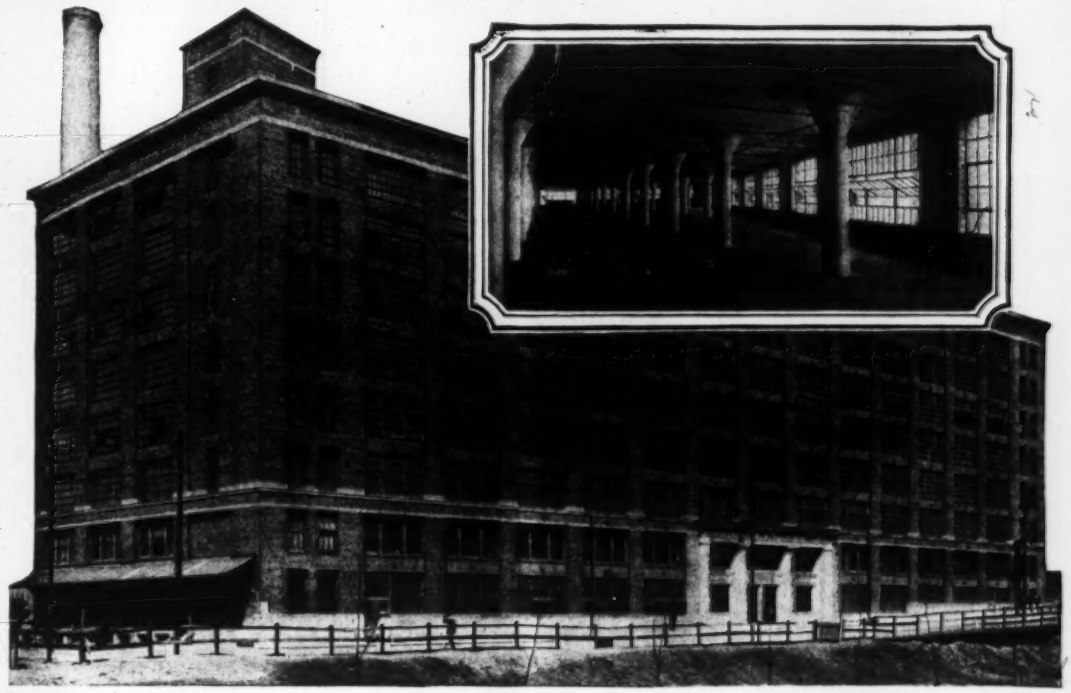

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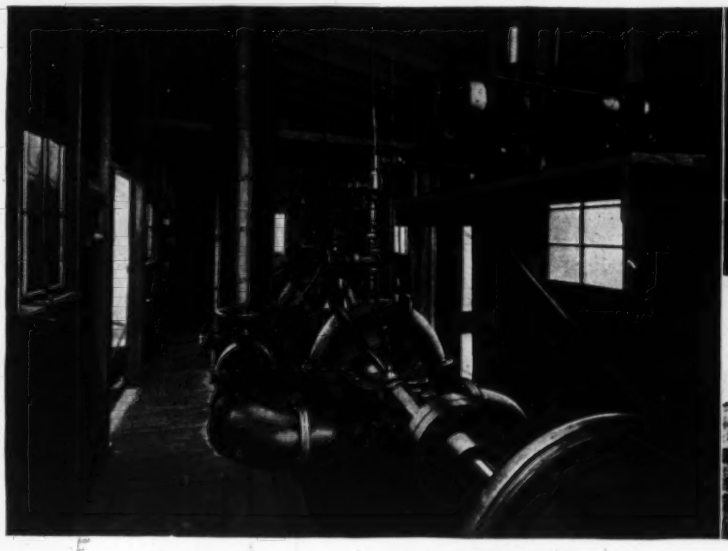

A Large Capacity Temporary Pumping Plant of Great Economy

In the construction of the Calumet Sag Channel, one of the contracts awarded James O. Heyworth of Chicago, was Section No. 1, comprising about 7000 feet of channel in which a large part of the work was solid rock excavation.

When the work had progressed sufficiently to make it advantageous to install an electric drive pumping installation, a plant was designed to handle between 7000 and 8000 g.p.m. against a total head of 45 feet, lifting water from the bottom of the canal to the normal ground surface.

This plant consists of two "American" 10-in. Type DSMD horizontal, double suction, completely bronze fitted, centrifugal pumps, each designed to deliver 3500 g.p.m. against 45 ft. total head when operated at 865 r.p.m., and each pump tested 78 per cent. mechanical efficiency. These pumps are driven by 75 hp., 3-phase, 60-cycle, 440-volt, 865 r.p.m., General Electric, squirrel cage motors, although only about 50 hp. is required.

The accompanying illustrations show exterior and interior views of the plant. The discharge pipe is 16-in. spiral riveted pipe, and the peculiar form at the top is necessitated to permit a steel concrete form tractor to be passed underneath.

Each pump is equipped with a 12-in. suction opening and a 10-in. discharge. On the suction of each pump is a 12-in. elbow turned downward, connecting with a funnel-shaped suction pipe fitted with a screen at the lower end. Each pump discharge is equipped with a 10-in. elbow and 10-in. gate valve, and the two discharge lines are joined by a reducing tee.

Priming is accomplished by a separate 4 by 5 plunger pump for each pump operated by a small alternating current motor and an auxiliary hand operated tank pump.

The two pumps are placed end to end in a housing only about 8 ft. wide by 25 ft. long, to provide side clearance for heavy machinery which must pass on either side during the excavating operations.

The attendance charge for this plant is very low, and notwithstanding it is operating under difficult conditions, there has been no expense for repairs during the over a year it has been in service. The up-keep also is low, making it far more economical than a steam plant of equal capacity. This is simply another demonstration of the saving in pumping costs of "American" centrifugal pumps.

Catalog 149 describes these pumps. Write for it.

The American Well Works

General Office and Works: Aurora, Illinois, U. S. A.
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Carbosota is doing its bit—

Several thousand gallons of Carbosota Creosote Oil were used in the *Brush-treatment* of timbers in these vessels.

Hundreds of thousands, perhaps millions, of gallons will be employed to retard decay in the timbers of Government ships. How insignificant is the cost in comparison with but one year's increased life!

It is proportionately equally as profitable to creosote all structural wood, used under conditions favorable to the development of decay, where the mechanical life is greater than the natural life.

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Launching of the Ferris-type wooden S. S. *Harney* at the ship-yards of the Supple and Ballin Shipbuilding Corporation, Portland, Ore. The partially completed sister ships *Mt. Shasta* and *Mt. Hood* are shown in the background. (*Illustration courtesy of builders.*)